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Pacific Northwest
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Recent Publications of the Pacific Northwest Research Station, Third Quarter 1986

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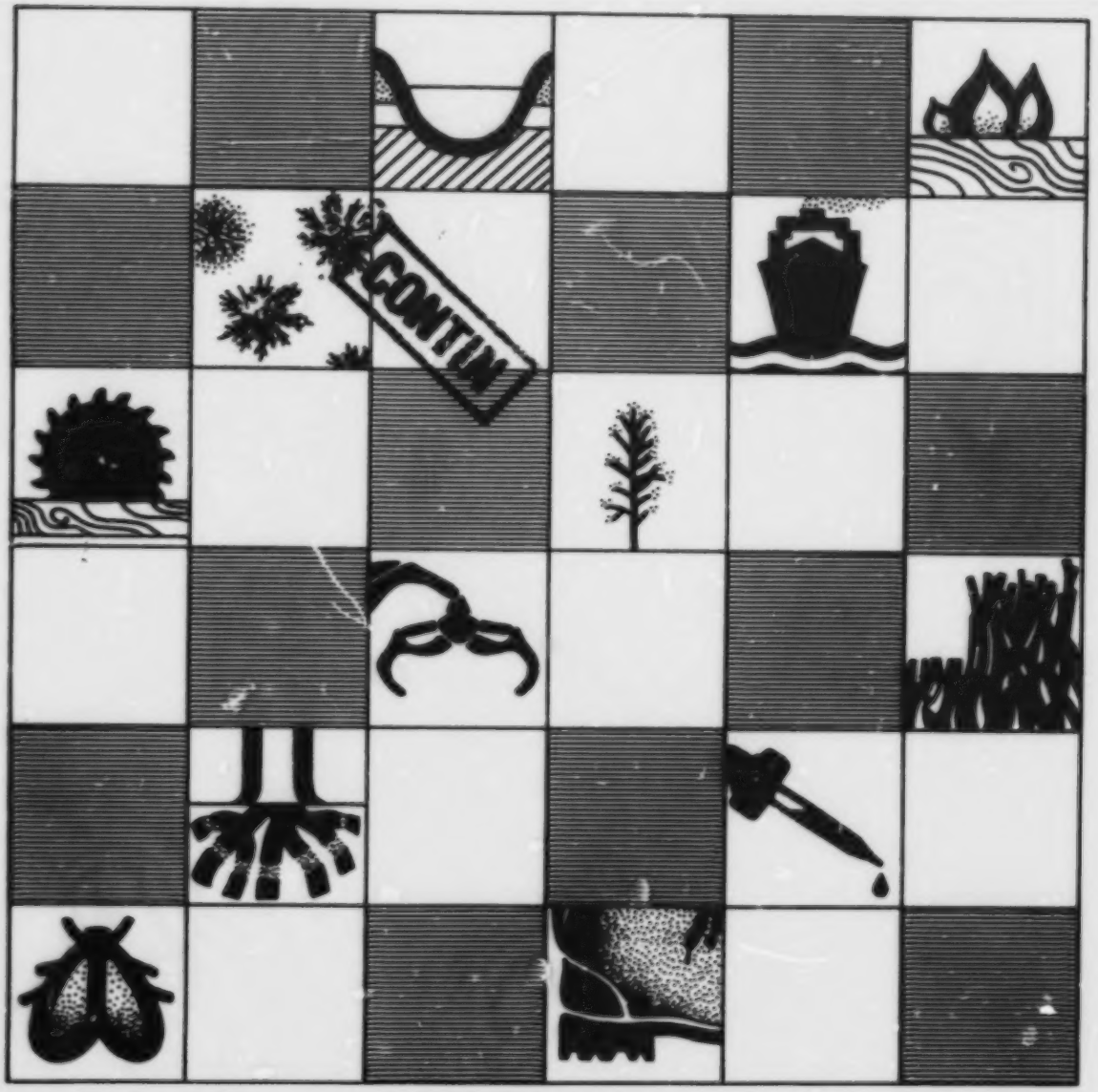

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Foreword

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Publications are arranged under general subject categories and alphabetically by author within categories.

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Biological Control

Nelson, E.E.; Thies, W.G. 84-250
Colonization of Phellinus weirii-infested stumps by Trichoderma viride. 1: Effect of isolate and inoculum base. European Journal of Forest Pathology. 15: 425-431; 1985.

Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) stumps infested with Phellinus weirii (Murr.) Gilb. were inoculated with the antagonist Trichoderma viride Pers. ex S.F. Gray. Colonization by Trichoderma spp. after 1 year was significantly higher in the upper 10 centimeters of the stump than in the mid- or lowest 10-centimeter section even though inoculum was placed to 30 centimeters into the stump. A pellet inoculum made from fermented barley grains and spores proved to be superior inoculum to colonized dowels, but no difference was found among the three isolates of T. viride tested. Decayed wood was more readily colonized than stained wood and was much more readily colonized than sound wood.

Keywords. Inoculation, root rot, Phellinus weirii, decay (wood), colonization.

Nelson, E.E.; Thies, W.G. 84-247
Colonization of Phellinus weirii-infested stumps by Trichoderma viride. 2: Effects of season of inoculation and stage of wood decay. European Journal of Forest Pathology. 16: 56-60; 1986.

Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) stumps infested with Phellinus weirii (Murr.) Gilb. were inoculated with pellets formulated from fermented barley and spores of three isolates of Trichoderma viride Pers.: Fr. After 1 year, Trichoderma spp. were isolated from stumps inoculated in June less frequently (12 percent) than those inoculated in February (23 percent) or in October (29 percent). Isolations of Trichoderma spp. from stumps with advanced decay were more frequent (46 percent) than from stained stumps (12 percent) or from sound stumps (2 percent). Success of isolation was directly related to wood decay at point of sampling, nearness to source of inoculum, and nearness to stump surface.

Keywords. Inoculation, root rot, Phellinus weirii, seasonal influences, decay (wood), colonization.

Stelzer, M.J.; Scott, D.W. NA
Evaluation of hydraulically applied baculovirus preparations to control western spruce budworm (Lepidoptera: Tortricidae) on grand fir. Journal of Economic Entomology. 78(5): 1105-1108; 1985.

The effectiveness of hydraulic applications of two baculovirus preparations (NPV and GV) applied at three dosage levels and two timings (peak second- and third-instar and peak third- and fourth-instar) was evaluated against western spruce budworm, Choristoneura occidentalis Freeman. Postspray budworm larval populations were reduced by approximately 90 percent on virus-treated trees and were significantly lower than on untreated control trees (P less than 0.05). Differences in control between the two virus types and three dosage levels were not significant. The virus treatments provided 35 percent protection of current foliage. Further development and the potential use of baculoviruses for budworm control will be restricted, however, by the lack of available virus. Supplies are now limited to small-scale batches produced at high cost by individual investigators.

Keywords. Baculovirus, virus (-insecta, nuclear polyhedrosis, insect control, western spruce budworm.

Chemicals

Buffam, P.E. NA
Spraying for control of the western spruce budworm in the Pacific Northwest. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 379.

Describes acreages sprayed and the insecticides used in the Pacific Northwest region (Washington and Oregon). References to type of aircraft and insecticides used for various control projects and references to source reports and literature are provided.

Keywords. Insecticides (-forest pests, spraying (-pest control, insect control, western spruce budworm.

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Livingston, R. Ladd NA

History of chemical treatment of the western spruce budworm in Idaho. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 380-383.

Describes acreages sprayed, dosages applied, and the insecticides used in operational and experimental treatments of western spruce budworm populations in the State of Idaho by National Forest, with references to literature and published reports.

Keywords. Insecticides (-forest pests, spraying (-pest control, insect control, western spruce budworm, Idaho.

Miles, Carl J.; Wallace, Louis R.; Moye, H. Anson NA

Determination of glyphosate herbicide and (aminomethyl)phosphonic acid in natural waters by liquid chromatography using pre-column fluorogenic labeling with 9-fluorenylmethyl chloroformate. Journal of the Association of Official Analytical Chemists. 69(3): 458-461; 1986.

An analytical method was developed to determine glyphosate herbicide and its major metabolite, (aminomethyl)phosphonic acid (AMPA), in natural waters. Sample pretreatment consisted of filtration, addition of phosphate buffer, concentration by rotary evaporation, and a final filtration before derivatization with 9-fluorenylmethyl chloroformate. The derivatives were separated by anion exchange liquid chromatography and measured with a fluorescence detector. Standard curves were linear over three orders of magnitude and minimal detectable quantities were 10 nanograms per milliliter for AMPA. The 20-fold concentration factor realized in sample preparation corresponds to parts-per-billion method detection limits for glyphosate and AMPA in natural waters. Recovery and storage studies are discussed.

Keywords. Water analysis, herbicides, chromatography.

Norris, Logan A. NA

Accuracy and precision of analyses for 2,4-D and picloram in streamwater by ten contract laboratories. Weed Science. 34(3): 485-489; 1986.

In a test of laboratory precision and accuracy, streamwater samples fortified with 0, 10, or 50 parts per billion (ppb) 2,4-D and picloram were submitted in quadruplicate for residue analysis to 10 laboratories that analyze samples for a fee. Varying amounts of the herbicides were detected by eight laboratories, and two reported no residues. Analyses from most laboratories had a negative bias (ranging from minus 2 to minus 92 percent), although a positive bias appeared in a few instances. Precision was highly variable, the coefficient of variation ranging from 3.4 to 200 percent. The accuracy range in 19 of 20 cases was plus or minus 100 to plus or minus 78 percent for 10 and 50 ppb 2,4-D and plus or minus 100 to plus or minus 114 percent for 10 and 50 ppb picloram, respectively. Results show that careful selection of contract laboratories and a quality assurance program should be part of monitoring for water contamination with herbicides.

Keywords. Herbicides, water analysis, water quality, picloram, 2,4-D.

Economics in Forest Management

Bible, T.D. NA

Economic considerations for spruce budworm management in North America. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 176-187.

There are three classes of nonbiomass, physical budworm effects--mortality, growth loss, scenic impairment--and four classes of forest management objectives--public and private Canadian and United States forest lands. Developing a single management response strategy is probably not possible, and implementation of more than one plan within a region may be necessary. This paper places these and related issues in perspective and reviews some basic principles for economic impact evaluation.

Keywords. Pest management, insect control, economic evaluation, western spruce budworm.

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Kellogg, Loren D.; Olsen, Eldon D.; Hargrave, Michael A. NA

Skyline thinning a western hemlock Sitka spruce stand: harvesting costs and stand damage. Res. Bull. 53. Corvallis, OR: Forest Research Laboratory. College of Forestry, Oregon State University; 1986. 21 p.

A multidisciplinary research study on management of young forests containing western hemlock (Tsuga heterophylla (Raf.) Sarg.) and Sitka spruce (Picea sitchensis (Bong.) Carr.) was conducted. This research bulletin summarizes sections of the study that examined harvesting cost and stand damage during logging.

Keywords. Costs (logging), logging (-forest damage, skyline logging, western hemlock, Sitka spruce.

Schallau, Con H; Maki, Wilbur R. NA

Input/output models and forest resource supply constraints revisited. Forest Science. 32(2): 401-404; 1986.

The authors respond to Vincent's contention that the results of Leontief (demand) and Ghosian (supply) interindustry models cannot be gainfully compared. Vincent's conclusion follows from a misinterpretation of (1) the Darr and Fight input/output analysis of Douglas County, Oregon, and (2) how the supply and demand models differ regarding causal factors and forward/backward linkages.

Keywords. Models, supply/demand (forest products), economics (forest products industries).

Economics in Wood Industry

Adams, Darius M.; Haynes, Richard W. NA

A spatial equilibrium model of U.S. forest products markets for long-range projection and policy analysis. TIMS Studies in the Management Sciences. 21: 73-87; 1986.

The timber assessment market model (TAMM) was developed to facilitate long-range planning and policy analysis in the U.S. forest products sector. The model provides an integrated structure for considering the behavior of prices, consumption, and production in both stumpage and product markets. A competitive spatial equilibrium system is used to model markets for solid wood products (lumber and plywood). The report describes the origins, structure, and simulation methods used in TAMM. Results of a baseline projection and a simulation of increased management intensity on private lands are presented to illustrate model applications.

Keywords. Markets (internal), supply/demand (forest products), projections (supply/demand), models.

De Borger, Bruno; Suongiorno, Joseph NA

Productivity growth in the paper and paperboard industries: a variable cost function approach. Canadian Journal of Forest Research. 15: 1013-1020; 1985.

Annual indexes of total productivity growth were calculated for the paper and paperboard industries of the United States between 1958 and 1981. The procedure relied on the hypothesis that each industry minimizes variable costs, conditional on the level of the remaining inputs. The variable cost functions revealed short-run economies of scale but long-run diseconomies, suggesting inefficient capacity expansion. Derived demands for energy, labor, and materials were inelastic. Demand for energy was much more responsive to price than labor and materials. There were substantial substitution possibilities between energy and materials and between labor and materials, but none between labor and energy. The productivity indexes that were computed showed a slightly increasing rate of productivity growth between 1958 and 1973, with a marked slowdown thereafter. This slowdown was explained by the rise in the price of energy. Average productivity growth was three to four times faster in the paper than in the paperboard industry between 1958 and 1981. This difference was partly explained by higher energy intensiveness and lower labor productivity growth in the paperboard industry.

Keywords. Paperboard, pulp'paper industry, economics (forest products industries).

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Gilless, J. Keith; Buongiorno, Joseph NA
PELPS: price-endogenous linear programming system for economic modeling. Res. Rep. R3329. Madison, WI: College of Agricultural & Life Sciences, University of Wisconsin; 1985. 34 p.

This report provides documentation and user information for PELPS, a system of computer programs to model economic sectors. Originally developed for the North American pulp and paper industry, the system can be used for any sector with many regions and commodities. The object of PELPS is to predict production, consumption, shipments, and prices of commodities in each region subject to specific scenarios regarding key macroeconomic variables such as population, income, and manufacturing costs. The theoretical structure used is that of spatial equilibrium under competitive markets. The numerical value of each equilibrium is calculated by maximizing a linear approximation of consumer and producer surplus, subject to supply, demand, shipment, and manufacturing constraints. The dynamic relationship between equilibria is described by recursive programming. The recursive equations predict exogenous shifts of supply and demand functions and endogenous changes of capacity of production. The document contains a mathematical description of the model as well as a detailed user guide for the computer programs.

Keywords. Pulp/paper industry, models, computer programs/programing, economics (forest products industries).

Gilless, James Keith; Buongiorno, Joseph NA
Simulation of future trade in wood pulp between Canada and the United States. The Annals of Regional Science. 19(2): 47-60; 1985.

A model of the North American pulp and paper industry was used to simulate wood pulp trade between various regions of Canada and the United States to the year 2000. Under the base assumptions, pulp imports from Canada were found to remain approximately constant until 1990 and then to double by the year 2000, reaching 5 million tons per year. Changing the cost or tariff assumptions resulted in changed levels of Canadian exports and products.

Keywords. Trade (forest products), models, pulp/paper industry.

Merrifield, David E.; Haynes, Richard W. NA
A cost analysis of the lumber and plywood industries in two Pacific Northwest sub-regions. The Annals of Regional Science. 19(3): 16-33; 1985.

Translog cost models are used to represent production technologies for the Pacific Northwest lumber and plywood industries. Expressions for cost elasticities are obtained along with measures for derived demand, factor substitution, and biased technological change. Estimation results over the 1950-79 sample period suggest the presence of output economies in specific industries, a potential impact of reduced factor prices, and the lack of a consistent trend in technological change across products and regional industries.

Keywords. Cost analysis, forest products industries, production costs, Pacific Northwest.

Merrifield, David E.; Singleton, William R. NA
A dynamic cost and factor demand analysis for the Pacific Northwest lumber and plywood industries. Forest Science. 32(1): 220-233; 1986.

A dynamic capital adjustment model is used to describe the Pacific Northwest lumber and plywood industries. The results suggest that own and cross-price elasticities of derived demand generally increase as the industries adjust toward long-term desired capital levels. Input requirement elasticities were found to be relatively constant for stumpage in both industries and for labor to output in the plywood industry. Employment levels in the lumber industry were found to be volatile.

Keywords. Models, economic evaluation, economics (forest products industries).

Ruderman, Florence K.; Haynes, Richard W. 85-330
Volume and average stumpage price of selected species on the National Forests of the Pacific Northwest Region, 1973 to 1984. Res. Note PNW-446. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; 1986. 37 p.

Stumpage prices have been compiled for major species for each National Forest of the Pacific Northwest Region of the USDA Forest Service for 1973-84.

Keywords. Stumpage prices, National Forests, Pacific Northwest.

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Ecosystem Function

Duncan, William F.A.; Brusven, Merlyn A. NA
Energy dynamics of three low-order southeast Alaska streams: allochthonous processes. Journal of Freshwater Ecology. 3(2): 233-248; 1985.

Allochthonous processes of three low-order southeast Alaska streams, exhibiting a range of riparian vegetation and successional stages before and after logging, were compared. Leaf-litter traps were used to estimate annual litter input. Leaf processing rates were measured by confining known amounts of leaf material in litter bags. Instream woody debris and stored and transported organics were estimated. Annual litter inputs of ash-free dry weight (AFDW) ranged from 52 grams AFDW per square meter on a clearcut watershed to 295 grams AFDW per square meter on a logged and deciduously revegetated watershed. All deciduous species tested (red alder, black cottonwood, salmonberry) had fast postleaching processing rates (k less than 0.005). The logged watersheds contained the largest amount of woody debris. Stored particulate organic matter (POM) was generally two or more times greater in depositional than erosional areas. Transported POM was highest in a logged watershed revegetated with deciduous riparian species. The results of this study suggest that logged watersheds with extensive riparian regeneration potentially increase the allochthonous energy base of streams in southeast Alaska.

Keywords. Stream analysis, southeast Alaska, watershed management, logging effects, Alaska (southeast).

Duncan, William F.A.; Brusven, Merlyn A. NA
Energy dynamics of three low-order southeast Alaska streams: autochthonous production. Journal of Freshwater Ecology. 3(2): 155-166; 1985.

Physical and biotic processes of three low-order southeast Alaska streams located on Prince of Wales Island were studied. These streams drained an undisturbed watershed representing a coniferous climax forest, a recently logged watershed with little riparian regeneration, and a logged watershed with heavy riparian growth. Community respiration and production were measured in closed, recirculating 12-L Plexiglas metabolism chambers by the dissolved oxygen method. The recently logged stream had the highest rates of production and respiration; the mature, climax forest stream, the lowest rates. Seasonal differences in production and respiration were apparently influenced by logging.

Keywords. Stream analysis, watershed management, logging, Alaska (southeast), southeast Alaska.

Harmon, M.E.; Franklin, J.F.; Swanson, F.J. [and others] NA
Ecology of coarse woody debris in temperate ecosystems. In: Advances in ecological research. London; New York: Academic Press; 1986: 133-302. Vol. 15.

Coarse woody debris (CWD) is an important component of temperate stream and forest ecosystems. The authors review the rates at which such debris is added and removed from ecosystems, and the biomass found in streams and forests. Coarse woody debris performs many functions in ecosystems, serving as autotrophic and heterotrophic habitat and strongly influencing geomorphic processes, especially in streams. It is also a major component of nutrient cycles in many ecosystems. The authors review these many functions and conclude that coarse woody debris is an important functional component of stream and forest ecosystems. Humans have greatly affected the amount of coarse woody debris found in temperate ecosystems by removing it and by changing the rate of input and the rate and pattern of loss. Management practices concerning the debris often have not been based on the numerous beneficial roles this material plays in ecosystems. Better scientific understanding of these functions and the natural factors influencing dynamics of coarse woody debris should lead to more enlightened management practices.

Keywords. Woody debris, ecosystem function, geomorphology, stream environment, nutrient cycling, decomposition.

Heath, Brian E. NA
Levels of asymbiotic nitrogen fixation in leaf litter in Northwest forests. Corvallis, OR: Oregon State University; 1985. [Pages unknown]. M.S. thesis.

Asymbiotic N fixation in the leaf litter in the Northwest was assayed by acetylene reduction. There were no significant differences between sites or between fixation levels for percent C, percent N, or C/N ratios. When acetylene reduction rates were modeled as a function of moisture and temperature, a significant amount of variation was explained, both for a controlled environment and in the field. Caution is needed when shortcut methods are used to calculate annual N input from asymbiotic fixation.

Keywords. Nitrogen fixation, litter (leaf).

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Van Cleve, K.; Chapin, F.S., III; Flanagan, P.W. [and others], eds. NA
Forest ecosystems in the Alaska taiga; a synthesis of structure and function. New York: Springer-Verlag; 1986. 230 p.

The taiga is one of the world's major vegetation regions. Within this ecological subdivision of the earth, wide variability is recognized and several subtypes have been proposed. This book is a synthesis of research on some ecological characteristics of the central Alaska taiga.

Keywords. Ecosystems, taiga, Alaska.

Fire

Patterson, E.M.; McMahon, C.K.; Ward, D.E. NA
Absorption properties and graphitic carbon emission factors of forest fire aerosols. Geophysical Research Letters. 13(1): 129-132; 1986.

Data on the optical absorption properties (expressed as a specific absorption) of the smoke emissions from fires with forest fuels have been determined for a series of low-intensity field fires and a series of laboratory scale fires. The specific absorption data have been used to estimate emission factors for graphitic carbon for these test fires to provide data needed for studies on regional visibility and tropospheric air chemistry, and for evaluating nuclear winter scenarios.

Keywords. Emissions, particulates, fire (forest).

Fish and Wildlife

Allen, Harriet L.; Brewer, Larry W. NA
A review of current northern spotted owl (Strix occidentalis caurina) research in Washington State. In: Gutiérrez, Ralph J.; Carey, Andrew B., tech. eds. Ecology and management of the spotted owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985: 55-57.

Two spotted owl research efforts are underway in Washington. One, a study of spotted owl population and ecology, is being conducted and funded by the Washington State Department of Game. The other is a study to evaluate the effectiveness of the Spotted Owl Management Area concept.

Keywords. Research programs, owls (spotted), Washington.

Benda, Lee E. NA
Behavior and effect of debris flows on streams in the Oregon Coast Range. In: Bowles, David S., ed. Delineation of landslide, flash flood, and debris flow hazards in Utah. Gen. Ser. UWRL/G-85/03. Logan, UT: Utah Water Research Laboratory, Utah State University; 1985: 153-162.

Debris flows in the Oregon Coast Range can affect morphology of stream channels and aquatic ecosystems. Steep first- and second-order channels periodically flush stored sediments by debris flow activity. Effects of debris flow on aquatic ecosystems, in particular the salmonid fishery, depend on whether debris flows travel along second-order streams or enter third-order channels.

Keywords. Debris flows, salmonids, fish habitat, geomorphology, Oregon (Coast Ranges), Crast Ranges--Oregon.

Benda, Lee E. NA
Delineation of channels susceptible to debris flows and debris floods. In: Proceedings, international symposium on erosion, debris flow and disaster prevention; 1985 September 3-5; Tsukuba, Japan. Tsukuba, Japan: National Research Center for Disaster Prevention; 1985: 195-201.

Debris flows in the Coast Range of Oregon represent a serious threat to downstream resources. Timber harvesting in conjunction with unstable soils and events caused by intense precipitation have produced 55 recent (1 to 30 years old) debris flows in Knowles Creek Basin. This flurry of activity afforded an opportunity to study the transport characteristics of debris flows. Our analysis indicates transport of debris flows in Knowles Creek is governed by specific morphologic features of the basin that include slope widths of channels and valley floors. Further, channel location in the basin controls certain aspects of channel and valley floor morphology and governs the transition of debris flows into debris floods. Based on characteristics of debris flow behavior, a method delineating channels susceptible to debris flows and debris floods is presented.

Keywords. Erosion (-hydrology, debris flows, Oregon (Coast Ranges).

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Boyle, Stephen A.; Samson, Fred B. NA
Effects of nonconsumptive recreation on wildlife: a review. Wildlife Society Bulletin. 13: 110-116; 1985.

Governmental agencies are interested in developing a sound basis for management of nonconsumptive outdoor recreation. Agency planners and managers must not only assess and provide for recreational demands, but also assess effects of recreational activities on natural resources, including wildlife and wildlife habitat. This paper evaluates available information on the effects of nonconsumptive outdoor recreation on wildlife in order to bring attention to, and provide a better understanding of, the relationship between recreationists and wildlife.

Keywords. Recreation, wildlife, animal behavior.

Brusven, Merlyn A.; Meehan, William R.; Ward, John F. NA
Summer use of simulated undercut banks by juvenile chinook salmon in an artificial Idaho channel. North American Journal of Fisheries Management. 6: 32-37; 1986.

The effects of introducing simulated undercut streambanks on the distribution of juvenile chinook salmon (Oncorhynchus tshawytscha) were studied in a naturally vegetated, flow-regulated channel in Idaho in 1980 and 1981. In all tests, mean fish weight was greater in covered than in open sections. Preference for the covered sections was highly significant during July and August tests. For all tests combined, 82 percent of the fish by numbers and 85 percent by biomass were collected in covered sections. The results suggested that undercut banks, as simulated by artificial shelters, are an important summer habitat component for juvenile chinook salmon that should be carefully evaluated by the manager.

Keywords. Fish habitat, salmonids, Idaho.

Bryant, Mason D. NA
Changes 30 years after logging in large woody debris, and its use by salmonids. In: Johnson, R. Roy; Ziebel, Charles D.; Patton, David R. [and others], tech. coords. Riparian ecosystems and their management: reconciling conflicting uses: Proceedings, first North American riparian conference; 1985 April 16-18; Tucson, AZ. Gen. Tech. Rep. RM-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; 1985: 329-334.

Changes in large woody debris in fourth- and fifth-order salmon streams with logged, unlogged, and partially logged riparian zones are documented from maps--for 1949 to 1960--and from field surveys in 1983 and 1984. Over the 30-year period, most changes in the amount of large woody debris occurred in the logged systems. During and immediately after logging large increases were noted, but in 1984 the amount of large woody debris in the logged systems was less than that observed before logging in most categories. Amounts of large woody debris in the other streams remained relatively stable. Thirty years after logging, habitat formed as a result of large debris in streams provides important rearing areas for juvenile salmonids. Results from this study emphasize the importance of managing riparian zones as a source of large organic debris.

Keywords. Stream debris, stream environment, salmonids, logging (-hydrology.

Bull, Evelyn L. NA
Ecological value of dead trees to cavity-nesting birds in northeastern Oregon. Oregon Birds. 12(2): 91-99; 1986.

Many forest birds of northeastern Oregon depend on dying, dead, and downed trees for nesting and foraging. Among these birds are the woodpeckers that prey on forest insects and provide cavities for secondary cavity nesters, many of which also prey on forest insects. The woodpecker species have partitioned the habitat and thus reduced competition for prey and nest sites. The secondary cavity nesters have not evolved this same degree of resource partitioning because different species use the same cavity in different years and even during the same year but at different times. Competition for nest holes can be fierce when cavities are a limited commodity.

Keywords. Woodpeckers, cavity nesters, snags, downed timber, old-growth stands.

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Carey, Andrew B.; Ruggiero, Leonard F. NA
Spotted owl management: meeting NFMA requirements through monitoring. In: Gutiérrez, Ralph J.; Carey, Andrew B., tech. eds. Ecology and management of the spotted owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985: 34-38.

In 1983, biologists from USDA Forest Service research, three National Forests in Washington, and the Washington Department of Game collaborated to design and implement an extensive program for monitoring the effectiveness of the management area system for spotted owls--a designated management indicator species and key vulnerable species. The program will evaluate the success of the management system as well as current standards and guidelines for management. This kind of collaborative effort may be the only practical way to effectively monitor a species that is possibly in jeopardy from the reduction of its habitat.

Keywords. Owls (spotted), monitoring.

Corn, Paul Stephen; Bury, R. Bruce. NA
Habitat use and terrestrial activity by red tree voles (Arborimus longicaudus) in Oregon. Journal of Mammalogy. 67(2): 404-406.

A critical need exists to document habitat use and establish the relationships of wildlife species in the old-growth forests of the Pacific Northwest, and to identify species of vertebrates who find optimal habitat there for breeding, nesting, and foraging. In 1983 pitfall traps were operated for 6 months in four age classes of Douglas-fir forests in and near the H.J. Andrews Experimental Forest, Linn and Lane counties, Oregon. This article reports on habitat use by red tree voles and establishes a range of distribution for them.

Keywords. Animal behavior, wildlife habitat, voles, old-growth stands.

Duncan, William F.A.; Brusven, Merlyn A. NA
Benthic macroinvertebrates in logged and unlogged low-order southeast Alaskan streams. Freshwater Invertebrate Biology. 4(3): 125-132; 1985.

The benthic macroinvertebrate communities of three low-order logged and unlogged streams in southeast Alaska were examined. The logged watersheds had the highest densities and biomass of benthic macroinvertebrates, while an unlogged coniferous climax forest watershed had the lowest. Benthic macroinvertebrate community composition was similar for key species among the three streams. Collector-gatherers were generally the most abundant functional group with up to 80 percent of the insect community; predator-engulfers were the second most abundant functional group. Salmonid fishes greatly altered the macroinvertebrate community composition during spawning by their mass disturbance of the streambed. Gravels disturbed during spawning were most rapidly recolonized by mayflies and stoneflies, especially Alloperla spp.

Keywords. Aquatic life, logging effects, southeast Alaska, Alaska (southeast).

Gutiérrez, R.J. NA
An overview of recent research on the spotted owl. In: Gutiérrez, Ralph J.; Carey, Andrew B., tech. eds. Ecology and management of the spotted owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985: 39-49.

The recent literature on the northern spotted owl (Strix occidentalis caurina) is reviewed and the salient features of the owl's natural and life history are presented. The conclusion is that northern spotted owls are dependent upon old-growth conifer forests of the Pacific Northwest.

Keywords. Habitat needs, wildlife habitat, owls (spotted), old-growth stands.

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Gutiérrez, R.J. NA

Information and research needs for spotted owl management. In: Gutiérrez, Ralph J.; Carey, Andrew B., tech. eds. Ecology and management of the spotted owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985: 115-118.

The information and research needs for spotted owl management are presented. The following priority list for research is given with the understanding that research needs may vary among USDA Forest Service Regions and that many research topics could effectively be coordinated or conducted together. Research and information are needed on: (1) population dynamics, (2) major prey ecology, (3) habitat requirements, (4) juvenile dispersal, (5) effects of habitat modifications on spotted owls, (6) inventory and monitoring, and (7) owl genetics.

Keywords. Wildlife habitat management, research needs, habitat needs, owls (spotted).

Gutiérrez, R.J.; Franklin, Alan B.; Lahaye, William [and others] NA

Juvenile spotted owl dispersal in northwestern California: preliminary results. In: Gutiérrez, Ralph J.; Carey, Andrew B., tech. eds. Ecology and management of the spotted owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985: 60-65.

Dispersal of juvenile spotted owls was studied in northwestern California during 1982 and 1983. Breeding spotted owls were not found there in 1982. In 1983, we radio-marked 13 juvenile owls. Eleven owlets survived to disperse between 2 September and 23 October 1983. We lost radio contact with four of the owls, and the remaining seven died. The management implications for these preliminary results are discussed.

Keywords. Wildlife habitat management, animal populations, owls (spotted), California.

Leckenby, Donavin A.; Adams, Arthur W. NA

A weather severity index on a mule deer winter range. Journal of Range Management. 39(3): 244-248; 1986.

Temperature, wind, and snow conditions predictably affect the nutrition, behavior, distribution, productivity, and mortality of free-ranging cattle and big game in winter. Data obtained with commonly available weather instruments could reflect episodes of positive and negative energy balances of free-ranging ruminants and would thus aid in scheduling feeding programs and planning manipulations in cover and forage. Such a weather severity index was developed and tested over 11 winters. Plausible levels of stress and episodes of relative severity were depicted during winters when mule deer exhibited low, moderate, and high mortality. The index curves mirrored over-winter decline of fat reserves probably sustained by mule deer. Lesser weather severity was predicted and measured in a western juniper woodland than in an adjacent rabbitbrush steppe community in south-central Oregon.

Keywords. Winter range, animal behavior, animal diet, weather effects, deer (mule).

Mannan, R. William NA

Habitat use by Hammond's flycatchers in old-growth forests, northeastern Oregon. The Murrelet. 65: 84-86; 1984.

Hammond's flycatchers (Empidonax hammondii) breed in a variety of forest conditions, but the most commonly reported situations are in open, mixed-coniferous and hardwood stands. Tall, dense patches of fir trees frequently occur within territories. The author found Hammond's flycatchers nesting in young- (85 years old) and old-growth (200 years old and older), mixed-coniferous forests of northeastern Oregon. Information is presented on selection of nest sites and foraging microhabitat by Hammond's flycatchers in old-growth forest.

Keywords. Wildlife habitat, old-growth stands, bird habitat.

BEST COPY AVAILABLE

Maurer, M.A.; Brusven, M.A. NA
Insect abundance and colonization rate in Fontinalis neo-mexicana (Bryophyta) in an Idaho Batholith stream, U.S.A. Hydrobiologia. 98: 9-15; 1983.

Insect colonization rate and abundance in the aquatic moss, Fontinalis neo-mexicana, were examined in the South Fork Salmon River, Idaho, from June 1978 to August 1979 to determine the importance of moss as a habitat for insects. In an artificial stream channel where flow, depth, and substrate were controlled, insect densities were 5 to 30 times greater in moss than in the mineral substrate; insect biomass was approximately two times greater. Insect densities in pebble substrates underlying moss and in adjacent mineral substrate were comparable. Moss cover did not appreciably alter insect densities in the underlying hyporheic zone composed of screened pebbles (1-2 centimeters in diameter). Insect ordinal and functional group composition was greater in moss than in the mineral substrate; however, species richness was similar. Chiromomids were the most abundant insects in moss.

Keywords. Aquatic life, Idaho.

Miller, Gary S.; Meslow, E. Charles NA
Dispersal data for juvenile spotted owls: the problem of small sample size. In: Gutiérrez, Ralph J.; Carey, Andrew B., tech. eds. Ecology and management of the spotted owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985: 69-73.

Collection and interpretation of dispersal data for juvenile northern spotted owls (Strix occidentalis caurina), based on preliminary information from Oregon, are discussed. Criteria for determining when dispersal ends and methods of measuring dispersal distances are examined. Small sample sizes, caused by unpredictable reproduction and high juvenile mortality, account for much of the problem in studying juvenile dispersal.

Keywords. Animal populations, sampling design, wildlife habitat management, owls (spotted).

Miller, Gary S.; Nelson, S. Kim; Wright, Will C. NA
Two-year old female spotted owl breeds successfully. Western Birds. 16: 93-94; 1985.

Keywords. Owls (spotted), reproductive behavior (animal).

Miquelle, Dale G.; Van Ballenberghe, Victor NA
The moose bell: a visual or olfactory communicator? Alces. 21: 191-213; 1985.

Two current hypotheses that explain the evolutionary significance of the moose (Alces alces) bell are: (1) during rut the male bell disseminates and transfers, by contact, the urine of the bull close to or directly onto the cow, and; (2) the bell acts as a visual cue that relates to sex and age, which in turn may be associated with rank. We tested the first hypothesis by describing wallowing behavior and determining whether females initiated contact with bulls' bells more than expected by chance. The second hypothesis was tested by comparing bell morphology in two populations of moose, and by relating the outcome of agonistic interactions to bell shape. Observations on wallowing behavior supported the hypothesis that the bell acts as a carrier of olfactory cues. Females, however, make physical contact with male bells less than expected by chance. Populations in Alaska and Ontario had similar age- and sex-related variations in bell shape. No relationship was found between bell morphology and dominance among females or among males during the period they are without antlers. The authors hypothesize that bell shape is a secondary sexual characteristic most important during the rut, and that moose may use bell morphology to assess social status of conspecifics.

Keywords. Moose, animal behavior.

Reeves, Gordon H. NA
Evaluation of streams for salmonid enhancement projects. In: Report of the 3d California salmon and steelhead restoration conference: 1985 February 23-24; Ukiah, CA. UCSGMAP85-4. [Place of publication unknown]: California Sea Grant College Program, Marine Advisory Program; 1985: 3-4. (Separates not available. Copies of entire report for sale by Dr. Robert J. Price, Marine Advisory Program Coordinator, Department of Food Science and Technology, University of California, Davis, CA 95616. Make $5 check payable to: Regents of the University of California.)

Successful enhancement projects for salmonid habitat require evaluation of both the physical and biological components of a system. Evaluation of physical conditions should include both the present and past history of a basin. Both the life history patterns of salmonids and the factors limiting their production must be known before enhancement is initiated. Evaluation of enhancement projects can take many years and should continue during the life of a project. A sample of all the different types of projects should be monitored.

Keywords. Fish habitat, fish management.

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Salwasser, Hal; Samson, Fred B. NA
Cumulative effects analysis: an advance in wildlife planning and management. Transactions of the North American Wildlife and Natural Resources Conference. 50: 313-321; 1985.

Keywords. Wildlife habitat management, cumulative effects.

Spalinger, Donald E.; Robbins, Charles T.; Hanley, Thomas A. NA
The assessment of handling time in ruminants: the effect of plant chemical and physical structure on the rate of breakdown of plant particles in the rumen of mule deer and elk. Canadian Journal of Zoology. 64: 312-321; 1986.

The rate of breakdown of plant particles in the rumen of mule deer (Odocoileus hemionus) and elk (Cervus elaphus) was investigated to determine if plant chemical or structural composition affects processing or handling time in ruminants. Two hypotheses initially tested were that particle breakdown rates in the rumen were (1) directly related to their lignin concentration and (or) (2) inversely related to their neutral detergent fiber concentration. The relative breakdown rate of a variety of dicot and monocot leaves and stems was an inverse function of lignin concentration, not a direct function as has been hypothesized. Neutral detergent fiber concentration was inversely related to breakdown rate. Inconsistencies in the relation, however, suggested a third hypothesis: the breakdown rate of the particles is directly related to mean cell wall thickness. Mean cell wall thickness was more closely related to differences in breakdown rate than any of the chemical variables measured, and the relations between chemical variables and breakdown rate were a result of their covariation with mean cell wall thickness. We suggest that ruminants should select forages based in part on mean cell wall thickness and that handling time may have a significant effect on forage selection and intake.

Keywords. Food preference, chemical composition (plant), rumen, Cervidae.

Thomas, Jack Ward NA
Wildlife in managed forests--a matter of commitment. In: Canada's forests: a commitment to the future: Proceedings of the National Forest Congress; 1986. [Place of publication unknown]: [Publisher name unknown]; 1986: E65-E70.

Virgin forests across North America are rapidly being brought under management. The welfare of wildlife in the managed forest is apt to serve as a surrogate for general environmental concerns. Therefore, forest managers need to plan carefully to ensure that wildlife diversity and the welfare of certain selected species are protected in the course of forest management.

Keywords. Wildlife habitat management, management planning (forest).

West, Stephen D. NA
Differential capture between old and new models of the Museum Special snap trap. Journal of Mammalogy. 66(4): 798-800; 1985.

Keywords. Trapping (live), mammals (land).

Wilzbach, Margaret A. NA
Relative roles of food abundance and cover in determining the habitat distribution of stream-dwelling cutthroat trout (Salmo clarki). Canadian Journal of Fisheries and Aquatic Science. 42: 1668-1672; 1985.

Emigration of wild cutthroat trout (Salmo clarki) from laboratory channels over 1-week trial periods was greater when conditions of food abundance was low rather than high (5 versus 15 percent of total trout biomass daily), regardless of the amount of cover (simulated cover structures added versus removed). When food abundance was high, emigration of trout was slightly greater under conditions of low than high cover. Cover had no effect on emigration rate when food abundance was low. Trout occurred in association with cover structures when food abundance was high, but not when food abundance was low. These experiments suggest that at summer temperatures, food abundance overrides cover in determining the abundance and microhabitat distribution of adult cutthroat trout within a stream.

Keywords. Fish habitat, fish management.

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Wisdom, Michael J.; Bright, Larry R.; Carey, Christopher G. [and others] NA

A model to evaluate elk habitat in western Oregon. Publ. No. R6-F&WL-216-1986. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region; 1986. 36 p. In cooperation with: U.S. Department of the Interior, Bureau of Land Management; and Oregon Department of Fish and Wildlife.

Forest managers need standard methods to measure the effects of land use proposals on Roosevelt elk habitat. One such method was developed for Rocky Mountain elk in the Blue Mountains of northeastern Oregon; it has been widely applied and has served as a guide for the development of similar models elsewhere. Relationships of elk use in response to sizing and spacing of forest stands and openings, habitat quality, and road density were presented and provided a basis for development of cover-forage area ratios and road density as a standard evaluation method. As a result, this paper presents a model to evaluate elk habitat based on the interactions of four variables: (1) sizing and spacing of forage and cover; (2) road density; (3) cover quality; and (4) forage quality.

Keywords. Wildlife habitat, land use, wildlife habitat management, models, elk.

General

Franklin, Jerry F. NA

Design of natural area preserves in Hawai'i. In: Stone, Charles P.; Scott, J. Michael, eds. Hawai'i's terrestrial ecosystems: preservation and management: proceedings of a symposium; 1984 June 5-6; Hawai'i Volcanoes National Park. Honolulu: Cooperative National Park Resources Studies Unit, University of Hawaii; 1985: 459-474.

Major factors need to be considered in designing natural area preserves: definition of objectives, determination of area requirements (with considerations of disturbance patterns and succession), identification of external threats, and identification of management activities. Special problems in preservation are discussed: large and migratory animals, aquatic ecosystems, succession, and relative value of large and small preserves. There are unique problems of preservation in Hawai'i including limited acreage of remaining natural lands, large numbers of naturalized and aggressive aliens, and extinctions of native biota. A conservation triage is suggested to develop preservation priorities. Intensive management is critical for most efforts at natural area preservation in Hawai'i.

Keywords. Scientific preserves, natural areas (research), Hawaii.

Franklin, Jerry F. NA

Objectives and nature of scientific programs in biosphere reserves. In: Peine, John D., ed. Proceedings of the conference on the management of biosphere reserves; 1984 November 27-29; Gatlinburg, TN. Gatlinburg, TN: Uplands Field Research Laboratory, Great Smoky Mountains National Park Biosphere Reserve; 1985: 57-66.

Three categories of research appropriate to Biosphere Reserves (reserve management, natural baseline, and resource management) are discussed, as well as the success of the "Man and the Biosphere" program in stimulating such activities. The potential for collaborative research between paired reserves has not been realized in part because of a lack of agency commitment. Technical considerations in research and monitoring programs are also discussed including the importance of long-term, comparative, and interdisciplinary studies and of data management, and the critical need for agency support in developing these programs.

Keywords. Biosphere reserves, scientific programs.

Klopsch, M.W.; Stafford, S.G. NA

The status and promise of intersite computer communication. In: Michener, William K., ed. Research data management in the ecological sciences. The Belle W. Baruch Library in Marine Science No. 16. Columbia, SC: University of South Carolina Press; 1986: 115-123.

One major goal of the National Science Foundation's long-term ecological research program is to facilitate collaborative research among sites. To do this, intersite communication will be required and can be handled electronically. Although the information revolution brings with it certain hazards, linking ecological research sites into a telecommunication network is feasible and has great potential for future ecological research.

Keywords. Data processing, computer applications, telecommunications.

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Muth, Robert M., Dr.; Lee, Robert G., Dr. NA
Social impact assessment in natural resource decision making: toward a structural paradigm. In: Becker, Henk A.; Porter, Alan L., eds. Methods and experiences in impact assessment: special issue based on the 1985 conference held in Utrecht, The Netherlands. Impact Assessment Bulletin. International Association for Impact Assessment; 1986; 4(3/4): 168-183.

Social scientists are increasingly aware of the importance of social structure as a variable to be analyzed in studies assessing social impact. This paper reports the results of research in which community social structure was specifically examined as an independent variable in a regional system of 52 rural communities in Alaska. A macrostructural survey instrument was used to inventory elements of community social structure provided by interviews with key informants and a variety of secondary sources. Communities were then ranked by their relative structural differentiation by means of Guttman scale analysis. Multiple regression analysis indicated that structural differentiation possesses greater predictive power than traditional aggregate variables (population level, rate of population increase) in explaining rates of community social pathology (mental health rates and divorce). The utility of the methodology for conducting social impact assessment is discussed. Suggestions for further research are presented.

Keywords. Sociology, natural resources management, Alaska.

Pacific Northwest Research Station 86-127
Recent publications of the Pacific Northwest Research Station, second quarter 1986. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; 1986. 16 p.

Keywords. Bibliographies (forestry).

Stafford, S.G.; Alaback, P.B.; Waddell, K.L.; NA
Slagle, R.L.
Data management procedures in ecologicl research. In: Michener, William E., ed. Research data management in the ecological sciences. The Belle W. Baruch Library in Marine Science No. 16. Columbia, SC: University of South Carolina Press; 1986: 93-113.

Ecological research requires a flexible, organized system for acquiring, documenting, and managing data. Careful documentation of data, best done through close collaboration of the researcher and data manager, is important if all users are to benefit from a centralized database management system. The key to future advances in ecological data management lies in the ability of data managers and scientists to become more cooperative and establish comprehensive databases.

Keywords. Data management.

Stafford, S.G.; Klopsch, M.W.; NA
Waddell, K.L. [and others]
Optimizing the computational environment for ecological research. In: Michener, William K., ed. Research data management in the ecological sciences. The Belle W. Baruch Library in Marine Science No. 16. Columbia, SC: University of South Carolina Press; 1986; 73-91.

Many options are available in computer hardware and software. The options should be considered as a unit to create the most useful environment. Hardware should be adequate for the job intended, and choices among vendors and support levels need to be evaluated carefully. Developing in-house software should be avoided if commercial packages are available.

Keywords. Data management.

Insects

Beckwith, R.C. NA
Effects of constant and fluctuating laboratory temperature on the western spruce budworm. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 89.

Western spruce budworm were reared in standard environmental control cabinets held at constant 20 degrees Celsius (C) or at cycling temperatures around 20 degrees C (10 to 32 degrees C) every 24 hours. A constant 16- and 8-hour photoperiod was used throughout the experiment. Second instars were reared individually on standard artificial diet in small Petri dishes until pupation. Pupae were weighed, sexed, and placed in clean dishes until adult emergence. Only individuals that emerged as adults were used in the analysis. Survival did not differ significantly between the two test temperatures; in both sexes, larval and pupal duration was significantly shorter and male pupae were significantly heavier when reared under fluctuating temperatures.

Keywords. Insect rearing, laboratory methods, western spruce budworm.

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Brookes, Martha H.; Colbert, J.J.; Mitchell, Russel G.; Stark, R.W., tech. coords. 84-111

Managing trees and stands susceptible to western spruce budworm. Tech. Bull. 1695. Washington, DC: U.S. Department of Agriculture, Forest Service, Cooperative State Research Service; 1985. 111 p.

Effects of western spruce budworm on trees and stands are described. Management strategies--including direct suppression and silvicultural methods--are compared, and operations are outlined for detection, evaluation, and treatment.

Keywords. Pest management, insect control, economic evaluation, westen spruce budworm.

Campbell, R. W. NA

Effects of birds and ants on pupae of the spruce budworm. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 100.

Trials similar to those designed to discern the effectiveness of birds and ants as predators of the western spruce budworm (Choristoneura occidentalis Freeman) were used in New York, Vermont, and New Hampshire to test the effectiveness of these guilds in controlling the spruce budworm (Choristoneura fumiferana (Clem.)). Neither birds nor ants showed consistent effects on survival, although both did apparently feed on budworms in some of the plots. Results for insectivorous birds confirm what many investigators have described, but results for foliage-foraging ants suggest that they may sometimes play a hitherto unsuspected role in the population dynamics of the spruce budworm, at least in fringe-type habitats, such as those found in northern New York.

Keywords. Ant predation, birds (-insect damage control, insect predators, population dynamics, western spruce budworm, spruce budworm.

Cates, R. G. NA

The effect of chemical defenses, nutrition, needle phenology, and physical parameters of Douglas-fir on western spruce budworm success. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 128-129.

The effects of secondary chemistry, nitrogen content, phenology of the current year's needles, and physical parameters of Douglas-fir trees on western spruce budworm larval growth, survival, and adult dry weight production are discussed. The importance of tissue quality in budworm success is clearly established, thereby providing the basis for suggesting that silvicultural manipulations may be effective against the budworm. The data further suggest a strong link between biotic and abiotic factors that lead to stress changes in defensive chemistry and nutrition of the host and eventually to outbreaks of budworm.

Keywords. Host trees, needles, phytochemistry, insecta, western spruce budworm, Douglas-fir, chemicals.

Crookston, N.L. NA

Forecasting growth and yield of budworm-infested forests. Part 2: Western North America and summary. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 214-230.

Forests in western North America infested with western spruce budworm usually have lower yields than noninfested forests. Research conducted during the Canada/U.S. Spruce Budworms Program-West increased our understanding of how budworm-caused damage affects tree growth, top-kill, mortality, and subsequent stand yields. Much of this research was incorporated into the techniques used to forecast yields in affected forests. A single set of models was constructed that combines what is known about forecasting budworm populations, the damage they cause, and the resulting forest yields in budworm-infested forests. Examples are presented to illustrate this set of models.

Keywords. Research programs, models, pest management, insect damage (-forest, yield (forest), western spruce budworm.

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Daterman, G.E.; Sower, L.L.; Sartwell, C. NA
Courtship disruption of western spruce budworm by aerial application of synthetic pheromone. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 386-387.

Synthetic pheromone dispersed by aircraft disrupted male western spruce budworm response to female-baited traps. Male trap response was reduced in proportion to disruption treatments which ranged from 2 to 128 grams of synthetic pheromone per hectare. Even the highest disruption dose, however, did not completely suppress male response. These results may mean that the mating or courtship-disruption approach to pest suppression is limited in value for practice use against the western spruce budworm.

Keywords. Western spruce budworm, pheromones, insect control, pheromone disruption.

Daterman, Gary E.; Miller, Jeffrey C.; NA
Hanson, Paul E.
Potential for gypsy moth problems in southwest Oregon. In: Helgerson, O.T., ed. Forest pest management in southwest Oregon: Proceedings of a workshop; 1985 August 19-20; Grants Pass, OR. Corvallis, OR: Forest Research Laboratory, Oregon State University; 1986: 37-40.

Gypsy moths could become established in southwest Oregon. Numerous plant species native to the area appear to be suitable hosts, the oaks and Pacific madrone being particularly susceptible. Damage potential is highest in the interior valleys and surrounding foothills, with damage to conifer species likely limited to those growing in mixed stands with broadleaf hosts such as oaks, madrone, and alder.

Keywords. Host trees, insect populations, gypsy moth.

Dennis, Brian; Kemp, William P.; NA
Beckwith, Roy C.
Stochastic model of insect phenology: estimation and testing. Environmental Entomology. 15: 540-546; 1986.

A biologically based phenology model is described for use in integrated pest management. The model predicts the proportion of insects in a population in various stages of development as a stochastic function of accumulated degree-days. The model is based on a logistic probability distribution with mean and variance changing through time. Maximum likelihood parameters of the estimates are easily computed with nonlinear regression packages. Appropriate statistical tests are presented for comparing models. Results should be useful to researchers and biological modelers who describe insect or plant phenology.

Keywords. Models, phenology, insect populations, western spruce budworm.

Eav, B.B.; Colbert, J.J.; Stipe, L.E. NA
Performance evaluation of the spruce budworm egg mass counter: prototype II. Rep. 86-6. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Forest Pest Management, Methods Application Group; 1986. 27 p.

A performance evaluation was conducted of the Prototype II automated spruce budworm egg mass counter. Data used in the evaluation were obtained from 525 branch samples representing three classes of tree conditions in each of the five primary host species found in the major outbreak areas throughout North America. The correlation between the machine counts and manually counted number of egg masses was, for most classes, not significant. Even for the three classes where the correlation was significant, the relationship between the two counts was not strong enough to warrant the use of machine counts to infer the number of egg masses. Spatial and spectral analyses of the detailed machine data available for 239 branch samples improve the correlation only very slightly. Improvement in the procedures for training the machine to recognize egg masses must be achieved before the automated egg mass counter is ready for operational use.

Keywords. Field equipment, data recording methods, insect surveys, egg masses.

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Foltz, John L.; Torgersen, Torolf R. NA
Accuracy of direct visual counts of western spruce budworm larvae (Lepidoptera: Tortricidae) on Douglas-fir and grand fir branches. Journal of Economic Entomology. 78: 1056-1058; 1985.

Late instar western spruce budworms on foliage samples can be counted accurately at the tree, but there may be substantial underestimates of budworm density if proper care and procedures are not used. In this study we visually examined branches for larvae at the tree and then later checked for additional larvae by beating the branches on baffle screens. Visual examinations underestimated larval densities on five plots by 2.5 to 15.1 percent. Factors identified as affecting the accuracy of larval counts were: experience of the examiners, procedures used in examining the foliage, temperature, stage of larval development, tree species, and amount of defoliation caused by budworms. Foliage examiners must be thoroughly trained and their work must be regularly and randomly checked to ensure accurate budworm counts.

Keywords. Sampling methods, insect surveys, western spruce budworm, Douglas-fir, grand fir.

Garton, E.O.; Takekawa, J.Y.; Langelier, L.A. NA
Enhancing habitat of avian predators. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 99.

Simple economic analysis showed that the value of biological control from birds preying on western spruce budworms exceeded $4,700 per square mile on two Douglas-fir stands in north-central Washington. Understory shrub and stand conditions conducive to avian predators are described as they relate to stand successional stage.

Keywords. Predators (insect) (-forest pest control, insect predators, birds (-insect damage control, bird habitat, western spruce budworm.

Holsten, Edward H.; Hennon, Paul E.; Werner, Richard A. NA
Insects and diseases of Alaska forests. Alaska Reg. Rep. 181. Juneau, AK: U.S. Department of Agriculture, Forest Service, Forest Pest Management, State and Private Forestry; 1985. 271 p.

Information on forest insects and diseases from south-central and interior Alaska has increased the last 5 years. Some insects and diseases in those areas are now damaging or are potentially hazardous to the environment. Although southeast Alaska forest pests remain serious, more emphasis has been given to south-central and interior Alaska forest pests as interest in forest management is rising in these areas. Not every insect or disease in Alaska is covered in the report: some are omitted because of their limited distribution or minor importance, and others are awaiting more comprehensive surveys and information on their economic importance. Emphasis has been given to insects and diseases in south-central and interior Alaska. The handbook has one section on insects and another on diseases. Each section has its own keys, illustrations, literature cited, glossary, and host index.

Keywords. Insecta, diseases (plant), keys (insect), keys (disease), Alaska (south-central), Alaska (interior).

Kemp, W.J. [W.P.] NA
Temperature and western spruce budworm development. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 87-88.

Western spruce budworm and host foliage phenology are modeled as functions of accumulated heat in day-degrees above 5.5 degrees Celsius (42 degrees Farenheit). The insect is assumed to follow a logistic probability distribution, and the foliage is assumed to follow a general logistic function. Data for 1982 and 1983 from the Starkey Experimental Forest, Oregon, showed the ability of the model to simulate significant shifts in cophenology. The authors hypothesize that this shift affected larval success in locating feeding sites, early larval survival, and subsequent differences in defoliation between those 2 years.

Keywords. Host trees, foliar analysis, phenology, insecta, defoliation damage, western spruce budworm, Oregon (Starkey Exp. For.).

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Kemp, W.P. NA

Historical western spruce budworm outbreak frequency. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 133-134.

Annual historical maps of western spruce budworm outbreaks were compiled to show frequency of outbreaks at each of 43 locations in the four-State area of Oregon, Washington, Idaho, and western Montana. Three frequency levels were used to partition the map into regions of high, medium, or low outbreak frequency. Regionally distinct climatic and soil structure and chemistry variations were apparent and are hypothesized to produce host plant stress that, in turn, is associated with higher rates of outbreak.

Keywords. Insect outbreaks, host trees, western spruce budworm.

Kemp, W.P. NA

Springtime behavior and budworm population dynamics. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 118.

The behavioral patterns of spring-emerging second instars of western spruce budworm appear to be extremely critical but remain largely unstudied. Recent studies have shown that the synchrony of host and insect phenology influences intensity of defoliation. These studies strongly suggested that springtime budworm survival was greater when adequate numbers of host shoots were sufficiently expanded than in years when the reverse was true.

Keywords. Insect behavior, population dynamics, insect populations, host trees, phenology, western spruce budworm.

Kemp, William P.; Dennis, Brian; Seckwith, Roy C. 85-045

Stochastic phenology model for the western spruce budworm (Lepidoptera: Tortricidae). Environmental Entomology. 15(3): 547-554; 1986.

Data were collected during two consecutive years on the Starkey Experimental Forest near La Grande, Oregon, to examine phenology of the western spruce budworm, Choristoneura occidentalis Freeman. The logistic probability distribution was used to describe the distribution of budworm developmental stages (instar II through adult) as a function of accumulated degee-days by year, plot, and host speci[illegible]. The logistic distribution described phenology accurately and was simpler to compute than other methods. Results should interest insect-pest managers and researchers who model phenology of plants and animals.

Keywords. Phenology, insect populations, models, western spruce budworm, Choristoneura occidentalis, Oregon (Starkey Exp. For. and Range), Starkey Exp. For. and Range--Oregon.

Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J.,eds. NA

Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985. 527 p.

The symposium was divided into four research areas and an invitational panel. The four research areas were biology, ecology, and population dynamics of the spruce budworms; economic and social impacts of the budworms in North American forests; tactics and strategies for prevention and suppression of damage; and integrated forest and pest management. Abstracts of the posters presented at the symposium are also included in the proceedings.

Keywords. Spruce budworm, research programs, insecta, insect populations, insect damage control (forest).

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Sartwell, C.; Daterman, G.E.; Twardus, D.B. NA
Moth captures in pheromone-baited traps relative to subsequent defoliation of Douglas-fir by western spruce budworm. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 240.

Cost-effective surveying of extensive areas for western spruce budworm requires an inexpensive trap that can be easily assembled, transported, installed, retrieved, and processed. Ideally, such a trap would operate through the flight season without requiring service. Based on previous work, a sticky trap made of a 2-liter milk carton seemed to meet these practical requirements. A basic problem with sticky traps is that they saturate with captured moths if the bait is too strong. Our approach in dealing with the saturation problem has been to test progressively weaker baits.

Keywords. Trapping (-forest pest control, pheromones, western spruce budworm, insect control, insect surveys.

Sartwell, Charles; Daterman, Gary NA
Control of forest insects with synthetic pheromones: status and prospects in western North America. In: Summaries of the proceedings of the 1985 western forestry conference: [Date of meeting unknown]; [Place of meeting unknown]. Portland, OR: Western Forestry and Conservation Association; 1985: 69. Abstract.

Synthetic pheromones are now used operationally for control of western pine shoot borer and ambrosia beetles. Nearing completion of development are techniques for controlling Douglas-fir tussock moth, Douglas-fir beetle, and mountain pine beetle.

Keywords. Pheromones, insect control, reproductive behavior (insect), western pine shoot borer, ambrosia beetles.

Sower, Lonne L.; Daterman, Gary E. NA
Premating searching activity of male western spruce budworm moths Choristoneura occidentalis (Lepidoptera: Tortricidae). The Canadian Entomologist. 1985 October: 1273-1274.

Premating flight activity by male western spruce budworm moths is described. Males search tree crowns for females efficiently, which reduces need to rely on pheromone-mediated distance attraction at high population densities.

Keywords. Reproductive behavior (insect), western spruce budworm.

Stipe, L.E. NA
Budworm management in Montana. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 377-378.

Descriptions of the acreages defoliated each year from 1948 to 1983 and the suppression projects to control the western spruce budworm are given. This history is presented in three phases: (1) 1948-66 when DDT was the principal insecticide; (2) 1967-76 when limited chemical applications were used in tests and silvicultural alternatives were applied; and (3) 1977-84 when efforts were focused on developing individual tree treatments and biological insecticide treatments for larger acreages.

Keywords. Pest management, defoliation damage, insecticides (-forest pests, biological control (-forest pests, western spruce budworm.

Stock, M.W.; Robertson, J.L. NA
Predicting response of western spruce budworm to insecticides. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 374-375.

Computer models have been developed that can predict the effectiveness of timing and dose of a variety of insecticides when applied to western spruce budworm or other forest defoliators. The model integrates information on insecticide dose, genetic tolerance and developmental stage of the insects, and foliage moisture conditions. Electrophoretic analysis of insect esterases has shown that specific genotypes are directly linked to insecticide susceptibility. Using a combination of genetic and toxicological analyses, the authors have been able to characterize western spruce budworm populations as inherently susceptible, tolerant, or resistant to two commonly used chemicals, acephate and carbaryl.

Keywords. Models, insecticides (-forest pests, insect control, western spruce budworm.

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Stoszek, K.G.[K.J.]; Mika, P.G. NA
Why risk rate sites and stands using multivariate regression models? In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 360-361.

Two multiple regression models that predict potential defoliation are discussed as a "first step" in understanding the site, stand, and forest variables that allow for various defoliation levels. The models suggest that budworm population levels in a given geographic and environmental setting are associated with both certain sites and certain states of the forest. Conditions conducive to budworm population increase are functionally related to certain states of the dynamically changing host-tree system (predisposition state), and these predisposition states occur with higher probability on certain (risk-prone) sites.

Keywords. Models, host trees, susceptibility, insect populations, western spruce budworm.

Stoszek, K.J. NA
Considerations for design of silviculture measures to reduce western spruce budworm hazard. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 363-364.

Results derived from the models of stand susceptibility to western spruce budworm defoliation are used to design silvicultural prescriptions. Risk-reducing silvicultural considerations are provided for specific forest habitat-type groupings. General moisture, temperature, and elevation conditions are used to partition budworm-prone forest stands and the appropriate management regimens. Soil nutrient and tree and stand vigor are considered critical factors in the development of these prescription alternatives.

Keywords. Silvicultural treatments, insect damage control (forest), western spruce budworm.

Stoszek, K.J.; Mika, P.G. NA
Interpreting the environment of western budworm outbreak-prone site-stand configurations. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 131-132.

Hazard of western spruce budworm defoliation was modeled as a function of site and stand variables for each vegetation series studied. The authors infer that differences among vegetation series reflect climatic differences and the effects of those climates on soil-forming processes and floristic composition, growth, developmental dynamics, and history of the forest and its fauna. High-risk elevation zones are associated with changes in soil pH and cation-exchange capacity related to altitude, harsh high-altitude conditions, and synchronization of host foliage and budworm developmental state. Average stand age and deviation in age in the western hemlock and subalpine fir series are shown to relate to hazardous conditions and to be associated with particular soil nutrient conditions. Stand density and amount of woody residue and duff are other variables discussed as indicative of hazardous conditions in a stand.

Keywords. Models, insect outbreaks, stand conditions, defoliation damage, host trees, western spruce budworm.

Torgersen, T.R. NA
Parasitoids and western budworm dynamics. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 104-105.

Between 1979 and 1981 intensive sampling for life table analysis was conducted at 23 sites in Idaho, Montana, Oregon, and Washington. Budworm egg masses, larvae, pupae, and pupal exuviae were sampled on Douglas-fir, grand fir, or both. Stage-specific mortalities caused by parasitoids, other natural enemies, and unknown causes were examined in terms of their contribution to generation change or population change from instar IV to adult. Species of parasitoids identified are provided. These studies suggest that parasitization contributed little to variation in survival rates from instar IV to adult or overall during the generation. Also, parasites are apparently slow to respond to increases in available hosts.

Keywords. Population dynamics, insect populations, parasites (insect) (-forest pest control, western spruce budworm.

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Torgersen, T.R. NA
Role of birds and ants in western spruce budworm dynamics. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 97-98.

Branch and whole tree exclosures were used to determine the role of bird and ant predators of the western spruce budworm. Cages were erected around branches and small trees (up to 9 meters) to exclude birds, and sticky barriers were used to exclude ants. Because ants move on and off branches in the canopy by dropping from branches higher in the canopy, ants gained access to some protected branches. Budworm survival from instar IV to adult in trees protected from birds or ants or both was consistently significantly higher when initial instar IV density was below 30 budworms per square meter. On control trees, these two predator guilds reduced adult densities 10- to 15-fold among trials in low density populations. At higher densities, natural enemies had virtually no effect on survival. Significantly, other mortality factors did not compensate for the absence of birds and ants where both of these guilds were excluded.

Keywords. Insect predators, birds (-insect damage control, ant predation, insect populations, western spruce budworm.

Volney, W.J.A. NA
Comparative population biologies of North American spruce budworms. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 71-84.

Patterns of variation in traits that determine population success of the spruce and western spruce budworms are compared. The two species differ little in their biologies. Geographic variation, where documented, tends to be clinal in the spruce budworm and racial in the western species. Their respective host species differ with similar patterns. Reconstructions of Holocene host-tree histories suggest that hosts of western spruce budworm have migrated little compared to hosts of spruce budworm. Examination of budworm life-history traits suggests that gene flow from high-elevation western populations to low-elevation eastern populations is more probable than the reverse. A model, based on the probable Holocene history of North American coniferous forests and budworm-dispersal patterns, is proposed to explain the current patterns of variation observed.

Keywords. Insect populations, models, western spruce budworm.

Volney, W.J.A. NA
The historical record and its value in developing chronologies for western spruce budworms. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 138-139.

The paper describes the currently available historical record and how to extend and interpret that record. History may be useful in understanding future climatic and atmospheric trends.

Keywords. Insect outbreaks, western spruce budworm.

Volney, W.J.A. NA
Temperature effects on development and survival of western spruce budworms. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 92.

Individual western spruce budworm developmental rates have a skewed unimodal distribution for which the log-normal distribution is an adequate mode. Developmental times often vary more within than among families, particularly for early instars. As temperatures increase, developmental rates increase super-linearly at low temperatures and linearly at intermediate temperatures, and are retarded at high temperatures. Temperatures at which these rate changes occur increase with physiological age. Temperature influence on adult flight and other aspects of life history are discussed.

Keywords. Phenology, insecta, western spruce budworm.

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Wagner, M.R.; Tinus, R.W. NA
Mechanism of tree resistance to spruce budworms--is there a terpene connection? In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 121-123.

Potential mechanisms in forest trees that may be responsible for preferential selection by the budworms are discussed, and mechanisms that are worthy of further evaluation are suggested. Factors present during the early maturation of foliage when the tree is under prolonged stress are proposed as prime candidates for further study. Change in terpene composition has been shown to be a potential resistance mechanism, and it is argued that this area deserves considerably more research.

Keywords. Tree resistance, insect damage (-forest, western spruce budworm.

Werner, Richard A.; Hastings, Felton L.; Holsten, Edward H.; Jones, Alice S. 86-008
Carbaryl and lindane protect white spruce from attack by spruce beetles (Coleoptera: Scolytidae) for three growing seasons. Journal of Economic Entomology. 79(4): 1121-1124; 1986.

Individual high-value white spruce, Picea glauca (Moench) Voss, can be protected from attacks by spruce beetle, Dendroctonus rufipennis (Kirby), by spraying the boles to a height of 12 meters for trees with diameters at breast height from 25 to 38 centimeters, with 1 and 2 percent carbaryl or 0.5 percent lindane. Success of each chemical was based on the number of spruce beetle attacks on treated and adjacent untreated trees. At 24 months after application, these insecticides provided 100 percent protection. Carbaryl at 2 percent was 96 percent effective and lindane was 94 percent effective at the end of the third growing season after treatment.

Keywords. Insect control, insecticides (-forest pests, spruce beetle, white spruce, Alaska (interior), interior Alaska.

Wulf, N.W. NA
Rating stand susceptibility to western spruce budworm. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J.; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 359-360.

A susceptibility index is described that rates stand hazard to western spruce budworm across the full range of forests that they inhabit. The model uses five general site and stand variables for the specific stand being rated, host tree characteristics of the surrounding stands (1000 acres), and the climate of the region containing the stand. These seven variables were scaled to operation multiplicatively to provide a rating between zero and 100. The range of index values for each variable was scaled to reflect the relative importance of that variable to increase or decrease the total. The model needs to be validated.

Keywords. Susceptibility, host trees, insect outbreaks, models, western spruce budworm.

Youngs, L. NA
Ant predators of the western spruce budworm: species composition and patterns of occurrence in eastern Oregon and western Montana. In: Sanders, C.J.; Stark, R.W.; Mullins, E.J; Murphy, J., eds. Recent advances in spruce budworms research: Proceedings of the CANUSA spruce budworms research symposium; 1984 September 16-20; Bangor, ME. Ottawa, ON: Canadian Forestry Service; 1985: 96.

The identity and distribution of ant species preying on the western spruce budworm were investigated in eastern Oregon and western Montana. Sticky traps that intercept ants falling from the canopy were shown to index both species composition and density of ants foraging in the canopy. Numbers, by species, are given for ants that were found feeding on budworm pupae. Twenty-four sites each in Oregon and Montana were selected along a moisture-temperature gradient indexed by vegetational composition (habitat type). Several site and stand variables were correlated with the abundance of ants collected at each site.

Keywords. Ant predation, insect predators, western spruce budworm.

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Logging

Adams, Paul W.; Campbell, Alan J.; Sidle, Roy C. [and others] NA

Estimating streamflows on small forested watersheds for culvert and bridge design in Oregon. Res. Bull. 55. Corvallis, OR: Forest Research Laboratory, College of Forestry, Oregon State University; 1986. 8 p.

Streamflow records were combined with basic watershed data from 80 small, forested basins to develop equations for predicting peak flows in Oregon. Area of drainage basin was most strongly and consistently related to streamflows; mean basin elevation and mean annual precipitation were also related to flows in areas of western Oregon. The equations can be used with site-specific data and risk assumptions to help design adequate culverts and bridges.

Keywords. Streamflow, bridge construction, culvert construction.

Carson, Barry; Mann, Charles N.; Schiess, Peter NA

An evaluation of cable yarding bunched trees on steep slopes. In: Forest operations in politically and environmentally sensitive areas: Proceedings, Council on Forest Engineering, 8th annual meeting; 1985 August 18-22; Tahoe City, CA. [Place of publication unknown]: [Publisher name unknown]; 1985: 95-102.

Bunches of whole trees created by a walking feller-buncher on slopes classed from 10 to 70 percent were evaluated in a study on the Quilcene Ranger District, Olympic National Forest, Washington, in July and August 1983. Dimensions and characteristics of the bunches as a function of slope, together with hook time and yarding production, were determined in a cable yarding study. Yarding production of the 171 bunches averaged between 177 and 238 trees per scheduled hour. Hook time varied greatly among the areas from 1.78 minutes per bunch to 3.21 minutes. If expressed in terms of the number of stems hooked per minute, however, differences between slope classes were insignificant.

Keywords. Logging equipment engineering, cable logging, yarding operations.

Hartsough, Bruce R.; Lambert, Michael B; Miles, John A. NA

Airship logging: parameters affecting load factors. Transactions of the ASAE. 28(5): 1363-1366, 1370; 1985.

A helicopter logging operation was studied to evaluate some parameters that affect load factors. Estimates of lift capacity appeared to be accurate and the weights of limbs and trim on the logs were negligible, as were the incremental forces required to break the logs free of the ground. Readings from the load indicator of the helicopter were precise but biased.

Keywords. Logging operations analysis/design, logging equipment engineering, helicopter logging.

Hartsough, Bruce R.; Miles, John A.; Darling, Gary W.; Mann, Charles N. NA

Running skyline analysis: should you consider yarder characteristics? In: Forest operations in politically and environmentally sensitive areas: Proceedings of the Council on Forest Engineering 8th annual meeting; 1985 August 18-22; Tahoe City, CA. [Place of publication unknown]: [Publisher name unknown]; 1985: 103-107.

Some timber harvesting units, planned with current analysis programs to be harvested with running skylines, could not be logged according to design specifications. Analysis programs usually assume that tension of the yarder's operating lines is one-third breaking strength. The assumption, however, overestimates payloads by large margins in some situations. Characteristics of a yarder must be included for reliable analysis. Yarding speeds and the effects of changing the lengths of the lines could then be compared. A skyline analysis program was modified to consider actual characteristics of a yarder. Payloads on actual profiles were analyzed to demonstrate the effects of including a yarder's capabilities.

Keywords. Logging operations analysis/design, skyline yarding, yarding operations.

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Toupin, Richard NA
Modeling and testing two-stump anchor systems for skyline yarders. Engineering Field Notes. Washington, DC: U.S. Department of Agriculture, Forest Service, Engineering Staff; 1986; 18: 5-11.

An option to using single stumps for anchoring cable logging systems is the use of multiple-stump anchors. A model was developed and field tested to establish the behavior of various rigging systems that use multiple-stump anchors. Field tests were compared with published guidelines on load transfer in multiple-stump anchors and with model calculations for four systems of two-stump anchors.

Keywords. Models, logging operations analysis/design, cable logging, skyline yarding.

Wu, Tien H. NA
Effect of vegetation on slope stability. Transportation Research Record. Washington, DC: National Academy of Science; 1984; 965: 37-46.

Two ways are considered in which vegetation can affect slope stability: changes in the soil moisture regime and contribution to soil strength by the roots. Simple analytical models that may be used to calculate water infiltration into soil and soil reinforcement by roots are reviewed, and their applications to stability problems are illustrated by examples. The need for reliable field data to support the analytical models is emphasized.

Keywords. Slope stability, soil moisture, root systems, models.

Mensuration

Alaback, Paul B. NA
Biomass regression equations for understory plants in coastal Alaska: effects of species and sampling design on estimates. Northwest Science. 60(2): 90-103; 1986.

Biomass prediction equations were developed for 9 species of shrubs and trees and 16 species of herbs and bryophytes from 24 coastal sampling sites in southeastern Alaska. Samples were taken from clearcuts and from second-growth and old-growth forests. Stem diameter was the best predictor of shrub biomass. For all herbs, except some ferns and members of the Liliaceae, percentage of ground cover was the best predictor. Regression equations accounted for 74 to 99 percent of biomass variation, and differences between slopes of most equations for different species were highly significant. Slopes and y-intercepts were generally related to vegetation sere or autecology of the species. Species with a monolayer canopy generally accumulated less biomass per stem or ground area than species with multilayered canopies. Date of sample collection (July 1 to September 1) was not related to biomass. From ten to fifteen 4-square-meter or thirty to sixty 1-square-meter systematically placed plots were needed for precise estimates of understory biomass in mature or old-growth forests. In recently disturbed vegetation, more than fifteen 4-square-meter or sixty 1-square-meter plots were needed for precise estimates. For estimating biomass to a given level of precision, 4-square-meter plots were more efficient than 1-square meter or 0.1-square meter plots.

Keywords. Biomass, understory layer, estimates, Alaska (southeast).

Catts, Glenn P.; Hiserote, Bruce NA
Use of high altitude photography (NHAP) color infrared transparencies in stand volume estimation for western Oregon conifer inventory. In: Use of auxiliary information in natural resource inventories: Proceedings; 1985 October 1-2; Blacksburg, VA. SAF Publ. 86-01. Bethesda, MD: Society of American Foresters; 1986: 114-123.

Keywords. Volume estimation, stand volume, photography, forest surveys.

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Catts, Glenn P.; Hiserote, Bruce NA
Use of panoramic aerial photographs to estimate forest stand volumes and land cover classes in northern California and southwestern Oregon. In: Use of auxiliary information in natural resource inventories: Proceedings; 1985 October 1-2; Blacksburg, VA. SAF Publ. 86-01. Bethesda, MD: Society of American Foresters; 1986: 95-113.

Keywords. Volume estimation, stand volume, photography, forest surveys.

Curtis, Robert O.; Hyink, David M. NA
Data for growth and yield models. In: Van Hooser, Dwane D.; Van Pelt, Nicholas, comps. Proceedings--growth and yield and other mensurational tricks: a regional technical conference; 1984 November 6-7; Logan, UT. Gen. Tech. Rep. INT-193. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station; 1985: 1-5.

Development of growth and yield systems is a continuing activity that is dependent on high-quality consistent data. Data come from some combination of inventory and experimental installations. Survey data are distinguished from "treatment response" or experimental data, which provide information on response to specific treatments. The latter are necessary for prediction of growth for regimes different from those that produced the present forest. Treatment response studies are expensive but essential. Costs, and need for program stability and continuity, make this an activity well suited to regional cooperatives.

Keywords. Models, data sources, growth models, yield (forest), mensuration (forest).

Hazard, John W.; Pickford, Stewart G. NA
Simulation studies on line intersect sampling of forest residue, part 2. Forest Science. 32(2): 447-470; 1986.

A simulation study was conducted to establish the statistical properties of line intersect sampling of forest residue on cable-logged and tractor-logged populations. These two distinctly patterned populations were described and reproduced in the computer by mathematical functions. Systematic grid sampling of clusters of one, two, and three lines with random and systematic orientation was performed. The strategies studied were maximum precision for fixed total cost, fixed total length of transect, and fixed number of primary sample sampling units (line clusters).

Keywords. Sampling design, line-intersect sampling, simulation, residue sampling.

Larson, Frederic R.; Herman, David A.; Winterberger, Kenneth C. NA
Determining true and magnetic north on aerial photographs. Photogrammetric Engineering and Remote Sensing. 52(6): 829-831; 1986.

Direction of true and magnetic north on a photo can be determined from measurements of shadow angle if the photo location and sun position are known. The basic methodology and computer program written in BASIC are presented along with an example of use in Alaska.

Keywords. Photo interpretation, remote sensing.

Means, Joseph E.; Helm, Mary E. 84-303
Height growth and site index curves for Douglas-fir on dry sites in the Willamette National Forest. Res. Pap. PNW-341. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985. 17 p.

Equations and curves are presented for estimating height and site index of Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) on hot, dry sites in the Willamette National Forest in western Oregon. The equations are based on the dissected stems of 27 trees. The height growth curves differ from those previously published for Douglas-fir. Instructions are presented for their use.

Keywords. Increment (height), site index, Douglas-fir, Oregon (Willamette Natl. For.), Willamette Natl. For.--Oregon.

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Mount St. Helens

Andersen, Douglas C.; MacMahon, James A. NA
The effects of catastrophic ecosystem disturbance: the residual mammals at Mount St. Helens. Journal of Mammalogy. 66(3): 581-589; 1985.

Individuals that survive the direct effects of disturbances in the community or ecosystem (residuals) can have major roles in determining the rate and pathway of subsequent secondary succession. Surveys of mammals, particularly small mammals (excluding bats), were conducted in the Mount St. Helens region in the 40 months after the eruption, and results are presented. Patterns in species representation that might exist along a gradient of disturbance "intensity" are presented, and the species that could potentially influence early plant successional patterns are listed. Inferences are made as to whether individuals captured were more likely to have been residuals (or their descendants), or immigrants from areas less affected by the eruption, from consideration of the timespan between the eruption and the capture date, the trapping location, and life history data. Inferences are also made about the animal-environment relationships that led to survey results and the likelihood of other types of disturbance, either natural or anthropogenic, producing similar results.

Keywords. Volcano effects, mammals (land), succession, Washington (Mount St. Helens).

Andersen, Douglas C.; MacMahon, James A. NA
Plant succession following the Mount St. Helens volcanic eruption: facilitation by a burrowing rodent, Thomomys talpoides. The American Midland Naturalist. 114(1): 62-69; 1985.

The May 1980 eruption of Mount St. Helens in southern Washington initiated plant succession over a broad region. Northern pocket gophers (Thomomys talpoides) survived in widespread subalpine and montane sites, and their burrowing and construction of mounds modified the structure of the tephra and led to placement of pre-eruption soils material on the tephra surface. The composition of the plant community and the pattern of seedling establishment was compared on and off the gopher mounds. More plant species survived on the mounds than on sites not on mounds. We concluded that pocket gophers can, therefore, strongly affect plant population dynamics in volcanically disturbed areas and may be an important agent in determining succession.

Keywords. Succession, rodentia, volcano effects, Washington (Mount St. Helens).

Andersen, Douglas C.; MacMahon, James A. NA
An assessment of ground-nest depradation in a catastrophically disturbed region, Mount St. Helens, Washington. The Auk. 103(3): 622-626; 1986.

Transect data indicated that dark-eyed juncos, a ground-nesting species, numerically dominated the avifauna in affected areas during the four breeding seasons after the May 1980 eruption of Mount St. Helens. Using artificial nests, we showed that the probability of a ground nest being damaged was greater in areas affected by the eruption than in similar habitats not affected, and that the influence varied with the nature of volcanic disturbance. We speculate that high local predation rates can influence subsequent breeding populations and discuss how the rates will be affected by succession.

Keywords. Volcano effects, predators, bird predation, bird habitat, Washington (Mount St. Helens).

Antos, Joseph A.; Zobel, Donald B. NA
Recovery of forest understories buried by tephra from Mount St. Helens. Vegetatio. 64: 103-111; 1985.

To determine the effects of tephra (aerial volcanic ejecta) on forest understory plants, six sites were chosen along a tephra depth gradient (23 to 150 mm) northeast of Mount St. Helens, Washington. Tephra 23 millimeters (mm) deep had almost no effect on cover and density of vascular plants and reduced bryophyte cover for only 2 years. Tephra 45 mm deep destroyed almost all bryophytes; deciduous herbs recovered by 1982, but some evergreen species did not. Tephra 75 mm deep reduced herb cover in 1982 to 32 percent and density to 26 percent of that in cleared plots, but shrub abundance was greatly reduced only where snow had been present during tephra deposition. Almost all cover was contributed by plants established prior to the eruption; seedling cover never exceeded 0.2 percent. Refugia with thin tephra, resulting from erosion, were vital to the survival of many species, especially bryophytes.

Keywords. Volcano effects, revegetation, succession, tephra, understory layer, Washington (Mount St. Helens).

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Antos, Joseph A.; Zobel, Donald B. NA
Seedling establishment in forests affected by tephra from Mount St. Helens. American Journal of Botany. 73(4): 495-499; 1986.

Seedling density on permanent plots at five sites was monitored for the first four summers after the deposition of 4.5 to 15 centimeters of tephra from the 1980 eruption of Mount St. Helens. Because the old-growth forests at the sites were not destroyed by the volcanic eruption, the plots were under a normal tree canopy. Almost no seedlings became established in 1980. By 1983, tree seedling density exceeded 35 square meters at all sites. Tsuga heterophylla seedlings were most common, and Abies amabilis seedlings were next. A dense layer of small trees may develop on the tephra, and long-term forest dynamics could be affected. There was no successful invasion by species not already present in the stands. Seedlings of some forest herbs, especially Tiarella trifoliata, were common, but many common forest species produce no seedlings. Whether or not these species will return to areas of the forest from which they were extirpated is not known.

Keywords. Tephra, volcano effects, regeneration (natural), seedling establishment, Washington (Mount St. Helens).

Collins, Brian D.; Dunne, Thomas NA
Erosion of tephra from the 1980 eruption of Mount St. Helens. Geological Society of America Bulletin. 97: 896-905; 1986.

Erosion of tephra on hillslopes north of Mount St. Helens was measured at intervals of several months between 1980 and 1983 by use of large arrays of stakes. Rill erosion was initially greater than sheetwash, but its importance decreased comparatively quickly. Both rill erosion and sheetwash decreased by one to two orders of magnitude over the 3-year period because a stable rill network developed and more permeable and less erodible substrates were created or exposed. The decrease occurred before plants were recovered. The causes for the rapid decline in erosion at Mount St. Helens explain patterns of erosion after several other recent tephra eruptions. Basin-wide annual rates of erosion were computed by mapping the surface cover, the hillslope gradient, and the texture and thickness of tephra and by using statistical relations developed between them and erosion rates. Annual erosion decreased from 26 millimeters between May 1980 and May 1981 to 1.8 millimeters between May 1982 and May 1983. Projecting this rate of decline into the future indicated that only about one-sixth of the tephra on hillslopes will be removed by water erosion before soil creep and other forms of mass wasting again dominate hillslope evolution.

Keywords. Tephra, erosion, volcano effects, Washington (Mount St. Helens).

Del Moral, Roger; Clampitt, Christopher A. NA
Growth of native plant species on recent volcanic substrates from Mount St. Helens. The American Midland Naturalist. 114(2): 374-383; 1985.

Subalpine vegetation on Mount St. Helens in southern Washington is recovering from the volcanic eruption of May 1980. The recovery rate depends on the nature and intensity of destruction suffered by the vegetation at a particular site. New volcanic substrates were collected annually from 1980 through 1983, and bioassays were used to analyze their ability to support plant growth. Lack of soil nutrients appears to be a major factor limiting recovery. Soil weathering, the influx of airborne nutrients, and the burrowing of small mammals enhance fertility. Despite the ability of some species to grow as well on these substrates as they do on infertile loam, many areas of the mountain were devoid of vegetation as of October 1984. Immigration, a function of isolation, rather than soil development, may be the key to revegetation of totally devastated habitats.

Keywords. Volcano effects, revegetation, Washington (Mount St. Helens).

Edwards, John S. NA
Arthropods as pioneers: recolonization of the blast zone on Mt. St. Helens. The Northwest Environmental Journal. Seattle: Institute for Environmental Studies, University of Washington; 1986; 2(1): 63-73.

A view of the recolonization of the blast zone on Mount St. Helens, southern Washington, from the perspective of the arthropods is presented. The special features of these small animals, in particular their size and their mobility, that underlie their expertise as pioneers are described, and conclusions about the role of arthropods in the process of succession are presented.

Keywords. Volcano effects, arthropoda, succession, Washington (Mount St. Helens).

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Fowler, W.B.; Lopushinsky, W. 84-122
Wind-blown volcanic ash in forest and agricultural locations as related to meteorological conditions. Atmospheric Environment. 20(3): 421-425; 1986.

During the spring and summer of 1981, airborne ash previously deposited from the 1980 eruption of Mount St. Helens volcano was monitored at several field locations near the major axis of the depositional patterns in Washington State. Airborne ash was collected daily with standard high-volume samplers and other equipment that sampled the ash at selected windspeeds. Analysis of high-volume filtered deposits showed poor linear correlations to local meteorological conditions. At Moses Lake, weights of windspeed-selected samples indicated an exponential increase in suspended material with increasing windspeed. Wind tunnel tests with ash from two locations varying in distance from the volcano showed that the finer ash fractions from both locations became airborne at similar windspeeds. Threshold wind velocity was about 12 kilometers per hour for newly deposited ash, compared to more than 69 kilometers per hour for ash consolidated by wetting and drying.

Keywords. Ash (atmospheric), wind velocity, volcano effects, meteorological conditions, volcanic ash.

Zobel, Donald B.; Antos, Joseph A. NA
Response of conifer shoot elongation to tephra from Mount St. Helens. Forest Ecology and Management. 12: 83-91; 1985.

To determine the impact of volcanic tephra from the 1980 eruption of Mount St. Helens, Washington, on growth of conifer saplings, increments of tree height and lateral branch elongation for 1975-82 were measured on a clearcutting. Abies amabilis Dougl. ex Forbes and Abies procera Rehd. trapped and retained the most tephra. Removing tephra from trees in 1980 increased growth of Abies amabilis and Abies procera; other species were not significantly affected by cleaning. Height growth of both cleaned and uncleaned trees of all species significantly increased after the eruption. The increase for Abies spp. and Tsuga heterophylla (Raf.) Sarg. was considerable and appeared to be a response to the eruption. This growth acceleration was apparently related to some beneficial effect or effects of tephra on the soil, which more than offset the adverse effect of tephra on the foliage.

Keywords. Volcano effects, tephra, shoot morphology, Washington (Mount St. Helens).

Zobel, Donald B.; Antos, Joseph A. NA
Survival of prolonged burial by subalpine forest understory plants. The American Midland Naturalist. 115(2): 282-287; 1986.

The capacity of forest understory plants for surviving burial was examined by use of plants buried by a 12- to 18-centimeter layer of volcanic tephra in May 1980 in an old-growth subalpine forest northeast of Mount St. Helens, Washington. Plant density and cover were measured in 1983 on fifty 1-square meter plots from which tephra had been removed in September 1982; these plants had been buried for almost three growing seasons. Results were compared with the same plots before excavation, with 50 plots cleared of tephra in September 1980, and with 100 plots on undisturbed tephra. Before excavation in 1982, there were 22 shoots per square meter in the tephra, mostly Erythronium montanum and Vaccinium spp. Few reached the surface, and most were still buried 8 to 12 centimeters deep. Compared with 1st-year vegetation in plots cleared 2 years earlier, excavation in 1982 produced equal shrub density but only 21 percent of the shrub cover, 55 percent of the herbaceous plant density with only 13 percent of the cover, and 18 percent of the bryophyte cover. All conifer seedlings had died. Although plants buried until 1982 had little potential to grow out of the deposit, they survived prolonged burial.

Keywords. Seedling survival, tephra, volcano effects, understory layer, Washington (Mount St. Helens).

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Mycorrhizae

Castellano, Michael A.; Trappe, James M. NA
Ectomycorrhizal formation and plantation performance of Douglas-fir nursery stock inoculated with Rhizopogon spores. Canadian Journal of Forest Research. 15: 613-617; 1985.

Basidiospores of seven species of hypogeous, ectomycorrhizal fungi were inoculated on various conifer species in a bare-root nursery. Inoculation with either Rhizopogon vinicolor Smith or R. colossus Smith succeeded with two seed sources of Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco). For R. vinicolor, the high spore application rate produced the most mycorrhizae on the greatest number of seedlings. For R. colossus, the high spore application rate produced the most mycorrhizae on the greatest number of seedlings of seed source 062, whereas the medium rate did best with seed source 252. Stem height and diameter of seedlings did not differ significantly between treatments and controls. Douglas-fir seedlings inoculated or not inoculated with spores of R. vinicolor were outplanted in southwestern Oregon. After 2 years, seedling survival, stem height, stem diameter, and seedling biomass were significantly greater for the inoculated seedlings compared with control seedlings. Although new feeder roots of both noninoculated and inoculated seedlings were colonized by indigenous fungi, R. vinicolor persisted on the old root systems of inoculated seedlings and colonized new feeder roots.

Keywords. Mycorrhizal inoculation, ectomycorrhizal, bare-root nursery stock, plantation performance, Douglas-fir.

Ho, Iwan; Trappe, J.M. NA
Polymorphism of acid phosphatase isozymes in ectomycorrhizal fungi. Journal of Cellular Biochemistry. 9C (suppl.): 198; 1985. Abstract.

Keywords. Phosphatase, isozymes, ectomycorrhizal fungi.

Hung, Ling-Ling L.; Molina, Randy NA
Temperature and time in storage influence the efficacy of selected isolates of fungi in commercially produced ectomycorrhizal inoculum. Forest Science. 32(2): 534-545; 1986.

Eight isolates of three ectomycorrhizal fungi were tested for effect of inoculum storage, inoculation rate and temperature on mycorrhiza formation with Douglas-fir. In general, fresh inocula of Laccaria laccata and Hebeloma crustuliniforme were the most effective; their effectiveness remained high for a month of storage, then declined rapidly for a short period, then slowly to the point of no mycorrhiza formation. The effectiveness declined more rapidly with lower inoculation rates. Storage at 2 degrees Celsius prolonged inoculum viability for at least 2 months storage at over 21 degrees Celsius. Inoculum from different fungal species or isolates within a species responded to storage temperature differently. Pisolithus tinctorius inoculum was the most sensitive: 1-month storage drastically reduced its effectiveness. Commercial inoculum effectiveness after storage and at low inoculation rates brings close the realization of widescale practical inoculation of seedlings in container nurseries.

Keywords. Inoculum, mycorrhizal inoculation, storage methods, cold storage, container nursery stock.

Kropp, Bradley R.; Castellano, Michael A.; Trappe, James M. 84-064
Performance of outplanted western hemlock (Tsuga heterophylla (Raf.) Sarg.) seedlings innoculated with Cenococcum geophilum. Tree Planters' Notes. 1985 Fall: 13-16.

In the first of two separate experiments, 2-year-old container-grown western hemlock seedlings, inoculated with Cenococcum geophilum Fr. had significantly (P less than 0.05) better top growth 2 years after outplanting than did noninoculated controls. Seedling survival was unaffected by mycorrhizal inoculation. In the second experiment, western hemlock seedlings inoculated and noninoculated seedlings planted on a clearcut in western Oregon survived and grew equally well during the first two growing seasons. Survival was not affected by mycorrhizal inoculation but after the second year was significantly (P less than 0.05) lower in rotten wood than in mineral soil.

Keywords. Mycorrhizal inoculation, seedling growth.

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Stewart, Elwin L.; Trappe, James M. NA
The new genus Austrogautieria (Basidiomycotina), segregate from Gautieria. Mycologia. 77(5): 674-687; 1985.

Austrogautieria is proposed as a new genus with six species. It accommodates Australian species formerly placed in Gautieria but differing from Gautieria spp. in character of its spores and in its lacking or having only a very reduced columella.

Keywords. Fungi (hypogeous), truffles (false), Australia.

Physiology

Means, Joseph E.; Cromack, Kermit, Jr.; MacMillan, Paul C. 81-326
Comparison of decomposition models using wood density of Douglas-fir logs. Canadian Journal of Forest Research. 15: 1092-1098; 1985.

Logs of Douglas-fir that had been on the ground for up to 313 years were grouped into five decay classes that ranged from 1, essentially undecayed, to 5, soft and incorporated into the forest floor but still identifiable. The mean residence times on the forest floor were 7, 17, 33, 82, and 219 years for decay classes 1 through 5, respectively. The single-exponential model of litter decomposition was fitted to the density of these logs. The summation-exponential model was constructed by summing single-exponential models fitted to lignin, cellulose, and the acid detergent soluble fraction. Both models gave virtually identical, statistically significant fits to the data. Wood density of these Douglas-fir logs decreased more slowly than that of most species other researchers have studied. Lignin decayed more slowly than cellulose or the fraction soluble in hot acid detergent, both of which decayed at rates that were not significantly different; thus, the summation-exponential model is recommended when these constituents are of interest.

Keywords. Wood density, decomposition, models, Douglas-fir, Pseudotsuga menziesii.

Plant Ecology

Christy, E. Jennifer NA
Effect of root competition and shading on growth of suppressed western hemlock (Tsuga heterophylla). Vegetatio. 65: 21-28; 1986.

Factors suppressing the growth of western hemlock (40-200 centimeters tall) were separated into components above and below the ground. Creating gaps in the canopy produced approximately a 30-34 percent increase in the overall amount of light available. Growth of the previously suppressed western hemlock was increased by trenching around individuals to minimize root competition and to a much less degree by altering the canopy. The combination of the two manipulations did not show a strong synergistic effect.

Keywords. Suppression (tree), root competition, old-growth stands, western hemlock.

Conard, Susan G. NA
Comparative water relations of three shrub species--preliminary results. FIR Report. Corvallis, OR: Oregon State University Extension Service, Forestry Intensified Research Program; 1986; 7(4): 4-5.

On a forest site in southwestern Oregon, the deciduous species ocean-spray and redstem ceanothus were found to be stronger competitors for soil moisture than was greenleaf manzanita, a sclerophyllous evergreen species. Ocean-spray appeared to be more shallow rooted than the other species.

Keywords. Plant-water relations, competition (plant), woody plants, Oregon (southwest).

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Dale, Virginia H.; Hemstrom, Miles; Franklin, Jerry 84-003

Modeling the long-term effects of disturbances on forest succession, Olympic Peninsula, Washington. Canadian Journal of Forest Research. 16: 56-67; 1986.

Fire, windthrow, clearcuts, and biotic disturbances were incorporated into a computer model of forest succession for the Pacific Northwest. The model projects regeneration, diameter increment, and death of individual trees on a 0.20-hectare plot. The model begins with the attributes of a 500-year-old stand from the western Olympic Peninsula in Washington State. Model runs were evaluated by comparing leaf areas and biomass by species over a 750- or 1500-year period. Large, old-growth Douglas-fir dominate the forest during their life spans. Because of their influence on stand dynamics, the number of Douglas-fir trees surviving a disturbance may be a good indicator of long-term effects. Following fire, windthrow, clearcuts, and biotic disturbances, western hemlock and silver fir dominate long-term forest structure.

Keywords. Succession, models, disturbance, Washington (Olympic Peninsula), Olympic Peninsula--Washington.

Frenkel, Robert E.; Moir, William H.; Christy, John A. NA

Vegetation of Torrey Lake Mire, central Cascade Range, Oregon. Madrono. 3(1): 24-39; 1986.

Torrey Lake Mire, 4 kilometers north of Waldo Lake, is typical of many small isolated wetlands in the predominantly forested central Oregon Cascade Range. Four mire communities, identified by floristic similarity analysis, exhibit distinct zonation with respect to a complex moisture gradient observed in the field and shown by detrended correspondence analysis ordination. Montane mires are often regarded as having higher species diversity than surrounding forest because mire communities are packed into small areas in response to a fairly sharp environmental gradient. Forest communities, occupying more uniform environments, extend over broad areas. Because of a sharp hydrological gradient, Torrey Lake Mire embraces several closely packed plant communities. Based on the jackknife procedure, individual mire communities are shown to have similar species diversity to that of the surrounding Tsuga mertensiana forest community.

Keywords. Vegetation classes, bog mires, bog plants, Oregon (Cascade Range), Cascade Range--Oregon.

Halpern, Charles B. NA

Montane meadow plant associations of Sequoia National Park, California. Madrono. 33(1): 1-23; 1986.

Twelve plant associations are recognized and described for montane meadows of Sequoia National Park based on 81 relevés. Three major groups are defined by growth-form dominants--mixed forb and grass associations, Carex and Scirpus associations, and Eleocharis associations. Major environmental factors influencing vegetation distribution include: (1) a complex moisture gradient incorporating water depth and movement and (2) site exposure and shading. Monitoring of water wells indicates that seasonal fluctuations of the water table are important in structuring the vegetation.

Keywords. Montane meadows, plant associations, hydrology, Sequoia National Park (California), ordination, classification.

Smith, Brad; Atzet, Tom; Wheeler, David; Franklin, Jerry NA

The western hemlock series of the Siskiyou region. FIR report. Corvallis, OR: Oregon State University Extension Service, Forestry Intensified Research Program; 1985; 7(3): 8-10.

This article is the seventh in a collection of brief reports describing forest and woodland vegetation in southwestern Oregon. Distribution and ecology of the western hemlock species are described, as are the distribution and composition of the western hemlock series. Environmental descriptions and relationships of nine plant associations in the series are summarized, and management implications are discussed.

Keywords. Communities (plant), habitat types, western hemlock.

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Thilenius, John F.; Smith, Dixie R. NA
Vegetation and soils of an alpine range in the Absaroka Mountains, Wyoming. Gen. Tech. Rep. RM-121. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; 1985. 18 p. (Copies available from: Rocky Mountain Forest and Range Experiment Station, 240 West Prospect Street, Fort Collins, CO 80526.)

Alpine vegetation on Carter Mountain in the Absaroka Range of northwestern Wyoming was classified into eight community types. Community type differences are the result of shifts in the standing crop and constancy of a few species. Floristic differences among community-types are not marked and very few species are confined to a single community type. Soils associated with each community type were classified to soil subgroup level. No consistent relations were found between the vegetation and soil classifications. Exposure to prevailing wind, elevation, soil-particle-size distribution, available water content, and snow accumulation were statistically significant environmental factors determining community type distribution.

Keywords. Communities (plant), classification (soil), Wyoming.

Plant Pathology

Edmonds, R.L.; Hinshaw, R.W.; Leslie, K.B. NA
A 24-hour deposition sampler for spores of Heterobasidion annosum. Phytopathology. 74(9): 1032-1034; 1984.

A 24-hour deposition sampler for airborne spores of Heterobasidion annosum (Fomes annosus) is described. Twenty-four 60-millimeter-diameter disposable petri plates are mounted on a circular Plexiglas sheet. Once an hour the petri plates filled with selective medium are rotated beneath a 60-millimeter-diameter opening in the sampler cover. The Plexiglas sheet is rotated by a 24-position rotary solenoid (stepping motor) driven by two 6V light weight rechargeable gel batteries in series. Electronic circuitry for the sampler is described. The sampler was used in a western hemlock (Tsuga heterophylla) stand in western Washington to examine diurnal spore deposition patterns in June and October 1982. In October, most spores were deposited during the night and early morning, but in June there was no distinct pattern.

Keywords. Field equipment, spores, root diseases, western hemlock, Fomes annosus.

Filip, Gregory M. NA
Symptom expression of root-diseased trees in mixed conifer stands in central Washington. Western Journal of Applied Forestry. 1(2): 46-48; 1986.

Two proposed seed-orchard sites in the Wenatchee and Gifford Pinchot National Forests of Washington State were examined prior to tree felling and land clearing to evaluate root-disease symptom expression in three species of conifers. About half the trees within infected areas had roots decayed by one of three principal root pathogens--Armillaria ostoyae, Phellinus weirii, and Fomes annosus--as determined from totally excavated root systems. Trees with aboveground symptoms had significantly more root decay than trees without symptoms. Crown symptoms and root-collar symptoms were accurate indicators of 72 percent of the root-diseased trees. Stain or decay of freshly cut stump surfaces were reliable indicators of 50 percent of the root-diseased trees.

Keywords. Root diseases, disease symptoms, mixed stands.

Range Management

Cimon, Norman; Quigley, Thomas NA
Evolution of a geographic information system: integration into the Oregon Range Evaluation Computing Facility. In: Proceedings of Geographic Information Systems workshop; 1986 April 1-4; Atlanta, GA. [Place of publication unknown]: [Publisher name unknown]; 1986: 99-109.

The trend toward decreasing cost and increasing power in small computers has had a direct impact on the scope of natural resource data management that can be undertaken and on the level at which data can be analyzed. Researchers can now gain direct and immediate feedback on their efforts through the use of tools such as Geographic Information Systems (GIS). GIS hardware and software requirements of the Oregon Range Evaluation Project evolved over time and were integrated into available computing resources. The original computer system was upgraded as was the GIS software. Additional processing power permitted concurrent digitizing and data analyses. Map review was distributed to networked IBM microcomputers. Further development would allow rapid and transparent communication between these systems and a newly acquired minicomputer.

Keywords. Information systems, computer mapping, range evaluation.

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Coe, Priscilla Kolb; Quigley, Thomas M. NA
Application of a geographic information system for the Oregon Range Evaluation Project. In: Proceedings of geographic information systems workshop; 1986 April 1-4; Atlanta, GA. [Place of publication unknown]: [Publisher name unknown]; 1986: 88-98.

A geographic information system (GeoBased STRINGS (TM)) was used for mapping by the Oregon Range Evaluation Project to handle spatial data and to produce data for an economic analysis and simulation model. This paper reviews a mapping system and discusses its effectiveness for the Range Evaluation Project. The paper describes how the software constructs and analyzes maps. Features that make the system unique--mainly how it integrates a simulated cartographic drawing process with analytical capabilities--are described.

Keywords. Information systems, computer applications, mapping, range management.

McInnis, Michael L.; Quigley, Thomas M.; Vavra, Martin NA
Using computer simulation to estimate grazing capacity and beef production. In: Research in rangeland management--1986 progress report. Spec. Rep. 773. Corvallis, OR: Agricultural Experiment Station, Oregon State University; 1986: 25-31. In cooperation with: U.S. Department of Agriculture, Agricultural Research Service.

Increased efficiency of red meat production is an important goal of livestock management that can be enhanced by properly applied rangeland improvement practices. The outcome of such improvements, however, cannot always be predicted. A method of estimating potential grazing capacity and beef production would be a welcomed tool for ranchers and resource managers in selecting the kind and location of improvement. Such a method would also be helpful in coordinating livestock management with other rangeland activities. Toward this end, a computer model is being developed to simulate animal unit months of grazing, and pounds of beef production potentially available from specific sites in central Oregon. This report outlines the structure, operation, and behavior of the preliminary model.

Keywords. Simulation, models, grazing capacity, livestock production.

Svejcar, Tony; Vavra, Martin NA
Seasonal forage production and quality on four native and improved plant communities in eastern Oregon. Tech. Bull. 149. Corvallis, OR: Agricultural Experiment Station, Oregon State University; 1985. 24 p.

Seasonal trends in forage quality and production were studied on improved and unimproved portions of four plant communities in eastern Oregon. The range improvements consisted of seeding and/or thinning. Improvement doubled forage production on the lodgepole pine site (thinned but not seeded), tripled production on the grassland and moist meadow sites (both seeded), and caused a sixfold rise in forage production on the mixed conifer site (thinned and seeded). Only in the case of the grassland, however, did range improvement lengthen the period when forage provided adequate nutrition for growth of yearling cattle; the improved nutrition can be attributed primarily to inclusion of a legume (alfalfa) in the seeding mixture. On the forested sites, thinning tended to cause forage to mature earlier and thus decline in forage quality faster than on unthinned controls.

Keywords. Forage production, forage plants, range improvement, communities (plant).

Recreation

Clark, Roger N. NA
Use and user characteristics: improved knowledge. In: Lucas, Robert C., comp. Proceedings--national wilderness research conference: current research: 1985 July 23-26; Fort Collins, CO. Gen. Tech. Rep. INT-212. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station; 1986: 251-252. (Separates not available. Proceedings available from U.S. Department of Agriculture, Forest Service, Intermountain Research Station, 507 - 25th Street, Ogden, Utah 84401.)

To understand phenomena associated with outdoor recreation, recreation managers need information about the number, types, and characteristics of users; use patterns; and site preferences for recreation habitat. In many respects, such information is similar to that needed by wildlife managers: number and characteristics of various types of wildlife species, and what constitutes their habitat. Knowledge gained from such information aids in predicting the effects of alternative management and social changes on the choices users make and on the quality of their experiences.

Keywords. Recreationists, recreation use, recreation management.

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Clark, Roger N.; Stankey, George H. NA
Site attributes--a key to managing wilderness and dispersed recreation. In: Lucas, Robert C., comp. Proceedings--national wilderness research conference: current research; 1985 July 23-26; Fort Collins, CO. Gen. Tech. Rep. INT-212. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station; 1986: 509-515. (Separates not available. Proceedings available from U.S. Department of Agriculture, Forest Service, Intermountain Research Station, 507 - 25th Street, Ogden, Utah 84401.)

Knowledge of important recreation sites and their attributes will assist managers in evaluating the consequences of changes as a result of other resource uses on dispersed recreation opportunities both within and outside of wilderness. Such information aids in developing strategies to prevent or mitigate undesirable impacts while taking advantage of positive changes to provide a desired range of public benefits. A case example for identifying important attributes of potential recreation sites in southeast Alaska is described. Suggestions on how to incorporate this information into multiple resource planning and management are discussed.

Keywords. Recreation resources, multiple use -)recreation, management planning (forest), recreation (dispersed), wilderness management.

Regeneration

Harcombe, P.A. NA
Stand development in a 130-year-old spruce-hemlock forest based on age structure and 50 years of mortality data. Forest Ecology and Management. 14: 41-58; 1986.

Tree age and long-term mortality data were used to assess influences on forest stand development in ten 0.4-hectare permanent plots established in 1935. The stand originated after a major fire in the 1840's with a period of rapid invasion (1851-70), followed by slower filling to full stand closure (1871-1900), recruitment suppression (1901-30), reinitiation of hemlock recruitment (1931-50), and continued slow recruitment (1951-present). Recruitment reinitiation was apparently associated with natural stand thinning and not with major disturbance. Large blowdown patches occurred in two plots in the 1960's, but the primary effect was release of hemlock advance regeneration rather than recruitment of new individuals. From 1935 to 1983, annual mortality (calculated from 5- to 10-year remeasurements) was 0.5-1.2 percent for both species. At this rate, continued thinning will likely allow a gradual transition to an all-aged forest, as population turnover time is short relative to frequency of intermediate or major disturbance.

Keywords. Stand development, age structure (stand).

Owston, Peyton W.; Weatherly, Howard G. NA
Herbaceous weed control for establishing conifers in southwestern Oregon--a preliminary report. FIR Report. Corvallis, OR: Oregon State University Extension Service, Forestry Intensified Research Program; 1986; 7(4): 5-7.

Glyphosate, hexazinone, and a mixture of dalapon plus atrazine were tested at three doses each (and compared with an untreated control) for improving establishment of five conifer species on clearcuts infested with grass and forbs. After 2 years, survival was generally poor, but several treatments improved conifer survival compared to the untreated control. Ponderosa pine and incense-cedar survived best in comparison with western white pine, sugar pine, and Douglas-fir.

Keywords. Weed control (forest), site preparation, regeneration (stand), southwest Oregon, Oregon (southwest).

Soil, Site, Geology

Geist, J. Michael; Schuster, Robert L. NA
Hole-in-the-Wall Gulch landslide, Baker County, Oregon. In: Proceedings, 22d symposium on engineering geology and soils engineering; 1986 February 24-26; Boise, ID. [Place of publication unknown]: [Publisher name unknown]; 1986: 227-244.

The Hole-in-the-Wall Gulch landslide, which closed Oregon State Highway 86 and impounded the Powder River, occurred in eastern Oregon 31 miles east of Baker; more than a year later, it continues to move. The landslide is actually composed of two slides: the upslope one is a translational rock slide that supplies source material to the other one, a downslope debris slide. This report is a synthesis of findings from investigations into the nature and movement of the landslide.

Keywords. Landslide, slope stability.

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Graham, James Duncan NA
Mass movement dynamics, geomorphology and their relationship to geology in the North Fork Siuslaw River drainage basin, Oregon Coast Range. Corvallis, OR: Oregon State University; 1985. [Pages unknown]. M.S. thesis.

Mass movement features are widespread throughout the North Fork Siuslaw River drainage basin in the Coast Range of Oregon. Hydrologic and geologic factors are demonstrably related to the occurrence and types of mass movement. Timber harvesting activities contribute to the occurrences of debris avalanches by factors such as loss of root strength and road construction on marginally stable slopes. Debris torrents in the study area were initiated by debris avalanches from the hillslope. Soil creep and block slides appear to be common in the study area but were not monitored or closely documented.

Keywords. Mass movement, geomorphology, Oregon (Coast Ranges).

LaManna, John M.; Bowers, Fred H. NA
A suction apparatus for orienting clay minerals onto porous ceramic tiles. Soil Science Society of America Journal. 49(5): 1318-1319; 1985.

A new design is presented for an apparatus that makes oriented mounts for the x-ray study of clay minerals. The apparatus is easily fabricated by drilling and tapping holes into a metal plate and adding standard screws, nuts, pipe fittings, and plastic funnels. The main advantages of this design are (1) ease of fabrication, (2) the ability to deposit clay cakes of almost any diameter onto tiles of almost any shape or size, and (3) the incorporation of a relatively large sample reservoir that will hold enough suspension to allow the operator to perform other tasks while the tiles are being prepared.

Keywords. Cations, laboratory methods.

McNabb, D.H.; Cromack, K., Jr.; Fredriksen, R.L. NA
Variability of nitrogen and carbon in surface soils of six forest types in the Oregon Cascades. Soil Science Society of America Journal. 50: 1037-1041; 1986.

Soil samples were collected from sites typical of six forest habitat types in the Cascade Range in western Oregon to determine the variability in total N, C, and mineralizable N. Within each type, 20 samples of surface soil (0-15 centimeters deep) were removed from around the outside perimeter of a 0.25-hectare plot. Averages of 23, 28, and 70 samples were needed to estimate the population mean of total N, C, and mineralizable N, respectively, with an accuracy of plus or minus 10 percent at a 95-percent probability. Variability was not reduced by reporting data on the basis of mass per area rather than concentration, but the method of reporting data affected the relative ranking of sites. Within-site variability was not generally related to microsite differences in slope or coarse fragment content.

Keywords. Soil sampling, forest types, habitat types.

Sidle, Roy C. NA
Processes influencing mass erosion in steep terrain. In: Transactions, 13th Congress of the International Society of Soil Science, extended informative summaries. Hamburg: ISSS Congress; 1986; 4: 1602-1603.

Keywords. Mass movement, landslide, ground water, roots.

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Sidle, Roy C. NA

Transport of sediment and organic material in streams of coastal Alaska. In: Sigbjarnarson, G., ed. Iceland coastal and river symposium proceedings. Reykjavik, Iceland: The University of Iceland; Icelandic Harbour Authority; National Energy Authority [and others]; 1986: 305-326.

The development of glacial streams into mature forest streams in coastal Alaska involves complex interactions among the fluvial system, riparian vegetation, and geomorphic processes in the watershed. Sediment transport characteristics and channel stabilities of a chronosequence of five youthful, developing streams in Glacier Bay National Park were compared with two more "mature" forest streams at Trap Bay and Alvin Bay. Youthful streams, 0 to 80 years following glacial retreat, are characterized by high sediment loads and a lack of large trees and shrubs in the riparian zone. In the youngest streams, most of the suspended sediment and some of the bedload sediment are supplied by melting ice sheets or remnant glaciers. Developing forest streams, 80 to 1000 years following glacial retreat, are characterized by the presence of larger trees in the riparian zone and an associated increase in channel stability. Alder initially invades the riparian zone and contributes to channel stability by colonizing on gravel bars and by stabilizing stream banks. With time, more mature riparian stands of alder, willow, and cottonwood eventually give way to Sitka spruce. Concentrations of total suspended solids during baseflows and stormflows are lower in developing forest streams than in youthful streams. Mature forest streams, free of glacial ice since the late Pleistocene, are generally supply-limited with respect to sediment transport. Large organic debris in these streams regulates velocity and provides sites for sediment storage. Transport of suspended sediment in these mature forest streams is lower than in developing and young streams during low to moderate flows.

Keywords. Sediment transport, organic matter, glaciation, Alaska (southeast), southeast Alaska.

Swanson, F.J.; Lienkaemper, G.W. NA

Geologic zoning of slope movements in western Oregon, U.S.A. In: Proceedings, 4th international conference and field workshop on landslides; 1985 August 23-31; Tokyo. Tokyo: Japanese Landslide Society; 1985: 41-45.

The Japanese approach to geologic zoning of slope movement types has useful application in the geologically diverse landscape of western Oregon, USA. The slope movement regime of an area can be characterized quantitatively in terms of total area affected, size distribution, and velocity and frequency of movement for slope movements of different types. Slope movements in Tertiary sedimentary rocks of the Oregon Coast Range include debris avalanches of high frequency (number per square kilometer per year) and low average volume, high frequency of debris torrents down first- to fourth-order channels, and large, deep-seated slope movement features that experience some of their movement in brief pulses (hours to days). Tertiary volcanic rocks in the Cascade Range have a lower frequency of debris avalanches and torrents and the large, deep-seated slope movements are mainly of the earthflow type that move slowly for prolonged periods (months) during the wet season.

Keywords. Landslide, slope stability, western Oregon, Oregon (western).

Swanson, Frederick J.; Oyagi, Norio; Tominaga, Masaki NA

Landslide dams in Japan. In: Schuster, Robert L., ed. Landslide dams: processes, risk, and mitigation: proceedings of a session sponsored by the Geotechnical Engineering Division of the American Society of Civil Engineers in conjunction with the ASCE convention; 1986 April 7; Seattle. Geotech. Spec. Publ. 3. New York: American Society of Civil Engineers; 1986; 131-145.

Damming of rivers by landslides is common in Japan because widespread unstable slopes and narrow valleys exist in conjunction with frequent hydrologic, volcanic, and seismic landslide triggering events. Such landslides can be broadly classed as fast (more than 1.5 meters per day) and slow (less than 1.5 meters per day). Fast landslides are further distinguished by the extent of valley floor receiving landslide deposits. Slow landslides are differentiated in terms of location of the basal shear zone in relation to the stream channel. Different landslide types have different effects on frequency and extent of damming and upstream and downstream flooding.

Keywords. Landslide, dams, Japan.

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Supply and Demand

Warren, Debra D. 86-194
Production, prices, employment, and trade in Northwest forest industries, first quarter 1986. Resour. Bull. PNW-137. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; 1986. 58 p.

Provides current information on lumber and plywood production and prices; employment in forest industries; international trade in logs, lumber, and plywood; volume and average prices of stumpage sold by public agencies; and other related items.

Keywords. Forestry business economics, lumber prices, plywood prices, timber volume, stumpage prices, employment (forest products industries), marketing (forest products), import/export (forest products), markets (external), economics (forestry business).

Timber Management

Franklin, Jerry; Halpern, Charlie; Smith, Brad; Thomas, Ted NA
The importance of Ceanothus species in U.S. forest ecosystems. In: Conard, Susan G.; Jaramillo, Annabelle E.; Cromack, Kermit, Jr.; Rose, Sharon, comps. The role of the genus Ceanothus in western forest ecosystems. Gen. Tech. Rep. PNW-182. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1985: 2-15. Section 2.

This paper discusses autecology, distribution, and taxonomic relationships of the major forest species of Ceanothus and considers some of the various roles that Ceanothus plays in western forest ecosystems.

Keywords. Autecology (plant), ecology (plant), Ceanothus.

Old-Growth Definition Task Group 85-305
Interim definitions for old-growth Douglas-fir and mixed-conifer forests in the Pacific Northwest and California. Res. Note PNW-447. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; 1986. 7 p.

Interim definitions of old-growth forests are provided to guide efforts in land-management planning until comprehensive definitions based on research that is currently underway can be formulated. The basic criteria for identifying old-growth Douglas-fir and mixed-conifer forests in western Washington and Oregon and California are given.

Keywords. Old growth, old-growth stands, mixed stands, coniferae, Pacific Northwest, California.

Walstad, J.D.; Brodie, J.D.; McGinley, B.C.; Roberts, C.A. NA
Silvicultural value of chemical brush control in the management of Douglas-fir. Western Journal of Applied Forestry. 1(3): 69-73; 1986.

Retrospective analyses of three conifer sites in western Oregon and Washington were conducted to determine the long-term silvicultural impact and economic value of chemical brush control treatments performed 10 to 25 years earlier. Comparisons of areas treated with phenoxy herbicides and untreated areas of the sites revealed significant differences in stocking and growth of Douglas-fir (Pseudotsuga menziesii). On all three sites, projects of mature yield and economic returns based on current stand conditions indicated substantial benefits for areas where brush control treatments were applied.

Keywords. Brush control, herbicides (-forest weed control, competition (plant), economic return.

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Watershed Management

Ingwersen, James B. NA
Fog drip, water yield, and timber harvesting in the Bull Run municipal watershed, Oregon. Water Resources Bulletin. American Water Resources Association; 1985; 21(3): 469-473.

Analysis of recent streamflow data from the Fox Creek Experimental Watersheds in the Bull Run Municipal Watershed, Oregon, indicated a significant recovery from the impact of a loss of fog drip on timber harvesting. Measurable impacts occurred only during June and July. Recovery began about 5 or 6 years after harvest, possibly the result of renewed fog drip from prolific revegetation. Position of the watershed and the extent of burning or removal of slash and residual vegetation during logging appeared to be important factors in predicting the impact of fog-drip reduction associated with planned harvest. Redistribution of fog drip may be a major factor in the measurements of local interception and water yield.

Keywords. Fog drip, logging (-hydrology, water yield, Oregon (Bull Run Watershed).

Lyons, Joseph K.; Beschta, Robert L. NA
Land use, floods, and channel changes: Upper Middle Fork Willamette River, Oregon (1936-1930). Water Resources Research. 19(2): 463-471; 1983.

Flow trends and channel characteristics from 1936 to 1980 were evaluated for the middle Fork of the Willamette River, which drains a 668-square kilometer forested watershed in the Cascade Range of western Oregon. An inventory of aerial photographs from 1959 to 1972 showed that landslides associated with roads and clearcuttings were 27 and 23 times more frequent, respectively, than in forested areas. Changes in channel patterns,also documented from aerial photographs, showed major increases in channel width from 1959 to 1967 and a trend of decreasing width from 1967 to 1980.

Keywords. Floods, channel morphology, channels (stream), sediment transport.

Sidle, Roy C. NA
Seasonal patterns of allochthonous debris in three riparian zones of a coastal Alaska drainage. In: Correll, David L., ed. Watershed research perspectives. Washington, DC: Smithsonian Institution Press; 1986: 283-304.

Three riparian zones of a small forest stream on Chicagof Island, Alaska, were sampled during a 26-month period for inputs of detritus and associated nutrients. Although average daily allochthonous inputs were highest from an old-growth hemlock-spruce riparian zone, only about half as much nitrogen was added to the old-growth stream reach compared to the alder-dominated reach. A Vaccinium spp.-dominated zone contributed the lowest amount of allochthonous biomass, nitrogen, and phosphorus to the stream.

Keywords. Riparian vegetation, detritus, water quality, stream debris, southeast Alaska, Alaska (southeast).

Yates, S.R.; Lomen, D.O.; Warrick, A.W. NA
Solutions for a Dupuit aquifer with sloping substratum and areal recharge. Computers and Geosciences. 11(4): 447-469; 1985.

Three solutions to the Dupuit-Forchheimer equation for soil water flow over a sloping substratum and areal recharge are presented in an interactive FORTRAN program: (1) a linear time-dependent solution, (2) a nonlinear finite difference solution, and (3) an exact steady state solution for the nonlinear problem.

Keywords. Aquifers, soil water, computer programs/programing.

Wood for Energy

Smith, W. Ramsey; Woodfin, Richard O., Jr. NA
Fuel characteristics of selected species of beached logs in southeastern Alaska. In: Tillman, David A.; Jahn, Edwin C., eds. Progress in biomass conversion. Orlando: Academic Press; 1984: 203-216. Vol. 5.

Timber harvested in southeastern Alaska is rafted to mills in the area. Logs lost from these rafts make up a large volume of timber washed up on beaches. This has a potential for products and wood for energy. This study examines the problems that may exist from using salt-contaminated fuel.

Keywords. Fuelwood use, saltwater effects, wood utilization, southeast Alaska, Alaska (southeast).

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Wood Utilization

Breiner, Tom A.; Arganbright, Donald G.; Pong, W.Y. NA

Performance of in-line moisture meters. In: Proceedings, Western Dry Kiln Clubs joint meeting; 1985 May 8-10; [location of meeting unknown] Corvallis, OR: School of Forestry, Oregon State University; 1985: 1-17.

The performance of in-line moisture meters (low frequency and high frequency) was evaluated for accuracy and precision relative to that of handheld resistance and power loss moisture meters. In-line moisture meters have greater potential accuracy for predicting ovendry moisture content (3.3 percent better with 95 percent confidence) for kiln-dried lumber than either the resistance or power loss type meters. In-line moisture meters gave reproducible measurements with less than 1-percent variation between repeat determinations of a set of boards and less than 4.9-percent variation for repeat determinations on any single board. In-line moisture meters used in this study cannot readily be used to identify the presence and extent of wet streaks.

Keywords. Moisture meters (wood), moisture content (wood).

Zobel, Donald B. NA

Port-Orford-cedar: a forgotten species. Journal of Forest History. 30(1): 29-36; 1986.

The diverse historic and present-day uses of Port-Orford-cedar are presented. Reasons for the decline of Port-Orford-cedar and the commercial future of the species are discussed.

Keywords. Timber utilization, Port-Orford-cedar.

General, Nontechnical

Bergstrom, Dorothy 86-096

Biological control of the larch casebearer. Forestry Research West. 1986 June: 5-9.

Procedures found to be essential to successful biological control of forest pest insects, using imported natural enemies, are discussed by an entomologist with 25 years of experience in importing, raising, and releasing parasites of the larch casebearer.

Keywords. Biological control (-forest pests, larch casebearer, Coleophora laricella, insect control.

Bergstrom, Dorothy 86-098

How about pruning Douglas-fir? Forestry Research West. 1986 March: 14-17.

A product recovery study done on Douglas-fir suggests that pruning (removing the lower branches) may be profitable in managed forests. More high grade products were recovered from 70-year-old trees that had been pruned 34 years earlier than from unpruned trees of similar age. The study was the most comprehensive of several studies on product recovery from pruned Douglas-fir.

Keywords. Pruning, Douglas-fir, lumber recovery.

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